TERRESTRIAL ATV TEST DATA SUMMARY
CHANNEL 53
Summer 1995

NTSC SIGNAL										
ITE NO	DATE	SITE_COORDINATE		DISTANCE (MI)	AZIMUTH (DEG)	FIELD STRENGTH (dBuV/m)	IMPAIRMENT GC_OFF (CCIR)	IMPAIRMENT GC_ON (CCIR)	NOISE FLOOR (dBm)	C/N (dB)
I-1A	08/14/95	35 16 08 N	80 41 17 W	1.2	35	103.4	4.5	5	-70.6	48.2
I-1B	08/14/95	36 16 16 N	80 41 24 W	1.2		93.5	4.5	5	-71.5	49.2
I-2A	08/15/95	35 27 03 N	80 38 10 W	14.0	225	99.5	4.5	5	-71.7	51.3
I-2B	08/15/95	35 27 03 N	80 38 10 W	14.0		84.9	4	5	-69.5	49.5
I-3A	08/16/95	35 32 50 N	80 52 51 W	23.1	330	80.4	4.5	5	-71.8	51.2
I-3B	08/16/95	35 32 50 N	80 52 51 W	23.1	0	49.1	0	0	-70	23.1
I-4A	08/16/95	35 11 13 N	80 39 54 W	4.6	230	104.3	4.5	5	-71.7	50
I-4B	08/16/95	35 11 13 N	80 39 54 W	4.6	0	88.6	4	4	-71.4	50
I-5A	08/17/95	35 34 23 N	80 54 46 W	25.6	35	79.9	4	4.5	-79.4	58.4
I-5B	08/17/95	35 34 23 N	80 54 46 W	25.6	125	69.6	3	3	-64	37.7
I-6A	08/21/95	35 23 45 N	81 00 19 W	20.7	300	56.3	2	2	-70.6	30.9
I-6B	08/21/95	35 23 45 N	81 00 19 W	20.7		65.9	2.5	3	-63.5	33.2
I-7A	08/21/95	35 10 39 N	80 50 59 W	10.6	100	100.9	4	4	-71.8	50.6
I-7B	08/21/95	35 10 39 N	80 50 59 W	10.7		79.1	3.5	4	-66.9	45.9
I-8A	08/22/95	35 05 19 N	80 47 47 W	12.8	160	84	3	3.5	-71.7	49.7
I-8B	08/22/95	35 05 19 N	80 47 47 W	12.8		70.1	2	2.5	-63.2	37.3
I-9A	08/24/95	35 16 13 N	81 01 29 W	19.0	160	84.8	3.5	4.5	-71.5	48.3
I-9B	08/24/95	35 16 13 N	81 01 29 W	19.0	0	63.7	1.5	2	-64.1	31.8
I-10A	08/24/95	35 10 48 N	80 42 43 W	5.1	330	110.7	4.5	5	-71.4	49.1
I-10B	08/24/95	35 10 48 N	80 42 43 W	5.1	0	99.4	4.5	5	-71.6	49

ATV SIGNAL TABULATED DATA DESCRIPTION

Column No.	Description
1	Site number
2	Date measurement was taken
3	Transmitted power indicator
4	Tap energy in dB of the equalizer
5	Azimuth in degree of the receiving antenna for best ATV results
6	Signal level in dBm at a stationary location in the middle of the 100-foot run
7	Pilot level of the signal in dBm
8	Comb filter indicator. "0" means Comb filter is out. "1" means Comb
9	Noise floor of the ATV signal in dBm
10	Carrier-to-Noise ratio at threshold in dB
11	ATV margin in dB
12	Recoded segment error rate (SER) for the 10-minute viewing segment

TERRESTRIAL ATV TEST DATA SUMMARY
CHANNEL 6
SUMMER 1995

		ATV SIGNAL									
TE NO	DATE	TRANSMITTER POWER (dB)	TAP ENERGY (dB)	AZIMUTH (DEG)	SIGNAL LEVEL (dBm)	PILOT LEVEL (dBm)	COMB FILTER	NOISE FLOOR (dBm)	C/N (dB)	MARGIN (dB)	10 MIN SEGMENT SER
1-8	07/26/95	Nominal	-7.7	340	-30.2	-38.1	1	-58.8	17.5	17.1	2
2-2	08/01/95	Nominal	-14.8	10	-33	-21.6	0	-57.9	15.31	13.6	3
2-8	08/01/95	6	-13	33	-28	-41	1	-52.4	24.4	0	Many
1B3	07/27/95	Nominal	0.8	275	-32.8	-44.2	0	-58.1	19.7	15.6	0
1B4	07/25/95	Nominal	-13.8	90	-28	-38.8	0	-59.5	15.7	22.8	0
1E3	07/26/95	Nominal	-13.2	275	-30.3	-41	0	-63.6	14.8	26.5	0
1E4	07/26/95	Nominal	-13.2	140	-27.8	-41.6	0	-57.7	15.2	18.7	0
2B3	07/27/95	Nominal	-15.8	350	-28.2	-39.3	0	-56.2	15.7	16.3	Few
2C1	07/31/95	6	-14.2	265	-38.1	-49	1	-53.8	15.7	0	30
2C3	07/31/95	6	-13.7	255	-30	-42.5	0	-55	25	0	Many
2D3	07/31/95	6	-12.1	345	-36.1	-47.9	0	-53.2	17.1	0	Many
2E1	08/01/95	Nominal	-13.7	320	-42.6	-54.55	1	-59	14.23	7.2	2
2E2	08/01/95	Nominal	-14.9	345	-42.4	-53.6	0	-61.6	15.2	12	5
050-5	08/03/95	Nominal	-13.5	180	-34.1	-44.2	0	-55.2	16.28	4.8	15
050-11	08/03/95	6	-13.1	235	-33.4	-43.7	1	-54.9	21.5	0	Many
085-9	08/03/95	Nominal	-15.1	95	-34.3	-44.8	1	-56.4	16.45	5.7	13
085-10	08/03/95	Nominal	-13.7	305	-38.9	-49.9	1	-56.4	16.5	1	10
085-12	08/02/95	6	-12.8	270	-37.7	-48.9	1	-59.2	21.52	0	24
085-13	08/02/95	Nominal	-14.8	65	-41.3	-36.2	1	-57.8	16.51	0	Lots
085-16	08/02/95	Nominal	-13.9	310	-42.3	-38.4	1	-54	10.7	1	30
110-9	08/09/95	Nominal	-13.6	135	-34.8	-46	1	-54.7	14.7	5.2	4
110-10	08/09/95	Nominal	-14.3	280	-39.2	-50.4	1	-58.8	15.2	4.4	5
110-14A	08/09/95	Nominal	-14.2	135	-34.5	-46.9	1	-39.8	4.9	0.4	4
110-15	08/09/95	6	-10.8	190	-39.5	-50	1	-51.5	12	0	**
110-16	08/09/95	6	-10	350	-42	-54.5	1	-44.9	2.9	0	**

TERRESTRIAL ATV TEST DATA SUMMARY

CHANNEL 6

SUMMER 1995

SITE NO	DATE	ATV SIGNAL TRANSMITTER POWER (dB)	TAP ENERGY (dB)	AZIMUTH (DEG)	SIGNAL LEVEL (dBm)	PILOT LEVEL (dBm)	COMB FILTER	NOISE FLOOR (dBm)	C/N (dB)	MARGIN (dB)	10 MIN SEGMENT SER
R185-14	08/04/95	6	-13.7	215	-34.6	-45.6	1	-54.3	15.8	3.9	0
R215-11	08/04/95	6	-14.1	175	-52.5	-62	0	-64	11.5	0	Many
R270-10	08/10/95	Nominal	-13.9	335	-37	-48.2	1	-55.8	14.1	4.7	6
R270-11	08/10/95	Nominal	-16.2	45	-37	-49	1	-55.1	15.4	2.7	5
R270-12	08/10/95	6	-15.6	270	-39.5	-50.7	0/1	-57.7	13.8	4.4	Lots
R270-14	08/07/95	6	-13.6	0	-43.6	-54.7	1	-62	18.4	0	Many
R270-15	08/07/95	6	-14.3	80	-47.5	-58.7	1	-64	16.5	0	Many
R270-16	08/07/95	6	-15	0	-47.8	-59.4	0	-62.7	14.2	8.7	Many
R300-9	08/11/95	Nominal	-13.9	355	-31.2	-42	1	-57	15.8	15	2
R300-10	08/11/95	6	-13.9	195	-35	-40.5	1	-51.2	10.8	5.4	0
R305-14	08/08/95	Nominal	-14.3	350	-34.9	-46	1	-51	15.1	1	0
R300-15	08/08/95	Nominal	-15.1	140	-36.4	-47	1	-53	13.5	3.1	0
R300-16	08/08/95	6	-14.1	215	-35.9	-46.4	1	-50.6	12.7	2	1
R305-2	07/28/95	Nominal	-16.1	208	-27.4	-38.6	0	-61.3	15.48	26.4	0
R305-8	07/28/95	Nominal	-11.4	295	-33.5	-42.6	0	-52	16.5	2	9

* ATV signal is not usable at this site due to interference and impulse noise.

TERRESTRIAL ATV TEST DATA SUMMARY
CHANNEL 6
SUMMER 1995

ATV SIGNAL											
SITE NO	DATE	TRANSMITTER POWER (dB)	TAP ENERGY (dB)	AZIMUTH (DEG)	SIGNAL LEVEL (dBm)	PILOT LEVEL (dBm)	COMB FILTER	NOISE FLOOR (dBm)	C/N (dB)	MARGIN (dB)	10 MIN SEGMENT SER
H-1A	08/14/95	Nominal	-16.4	45	-26.9	-39	0	-68.3	15	65.4	0
H-1B	08/14/95	Nominal	-13.4		-27.8	-38.5	0	-71.3	17.4	72.1	0
H-2A	08/15/95	Nominal	-14.7	215	-34.2	-38	1	-70.5	14.8	41.5	6
H-2B	08/15/95	6	-9.6		-20.4	-17	1	-41.7	21.27	0.03	Many
H-3A	08/16/95	Nominal	-16.3	340	-49.9	-60.4	0	-63.1	14.2	22	0
H-3B	08/16/95	6	***	***	***	***	***	***	***	***	***
H-4A	08/16/95	Nominal	-17.1	250	-34.4	-38.6	0	-65.6	15.5	46.7	0
H-4B	08/16/95	Nominal	-4		-28.4	-39.4	1	-58.4	17.2	27.8	5
H-5A	08/17/95	Nominal	-15.6	30	-46.4	-57.6	0	-58.2	14.8	13	8
H-5B	08/17/95	6	-12.7		-29.1	-40.9	0	-43.8	14.7	45.8	Many
H-6A	08/21/95	Nominal	-15	260	-35.3	-44.27	1	-64.08	15.35	27.5	1
H-6B	08/21/95	Nominal	-9.6		-31.3	-33.95	0	-44.71	15.67	-2.3	6
H-7A	08/21/95	Nominal	-16	110	-33.4	-44	0	-69.15	15.32	42.4	0
H-7B	08/21/95	Nominal	-9		-31.4	-43.9	0	-60.32	15.94	24	0
H-8A	08/22/95	Nominal	-14	180	-34.4	-40.5	0	-68	15.1	37.5	0
H-8B	08/22/95	Nominal	-8.1		-36.2	-42.6	0	-63.2	17	24	2

*** Signal too weak to measure.

TERRESTRIAL ATV TEST DATA SUMMARY
CHANNEL 53
SUMMER 1995

					ATV SIGNAL						
SITE NO	DATE	TRANSMITTER POWER (dB)	TAP ENERGY (dB)	AZIMUTH (DEG)	SIGNAL LEVEL (dBm)	PILOT LEVEL (dBm)	COMB FILTER	NOISE FLOOR (dBm)	C/N (dB)	MARGIN (dB)	10 MIN SEGMENT SER
C1-8	07/26/95	Nominal	-15.1	355	-34	-47.1	0	-71.7	15.1	31.6	0
C2-2	08/01/95	Nominal	-12.2	50	-34	-47.1	0	-71.3	19.1	21.2	0
C2-8	08/01/95	Nominal	-12.2	330	-41.6	-56.3	0	-71.74	15.31	14.9	0
G1B3	07/27/95	Nominal	-10.4	320	-36	-45.5	1	-71.77	16.3	35.5	0
G1B4	07/25/95	Nominal	-12.3	90	-28.9	-41.8	0	-72.2	17.6	25.7	20
G1E3	07/26/95	Nominal	-15.7	235	-34.4	-46.2	0	-72	16.9	22.7	0
G1E4	07/26/95	Nominal	-14.1	80	-41.3	-52	0	-71.7	19.6	22.8	0
G2B3	07/27/95	Nominal	-16.1	335	-34.1	-46	0	-71.77	15.15	38.5	0
G2C1	07/31/95	6	-14.3	295	-51	-61.3	0	-72.2	10.4	10.6	Many
G2C3	07/31/95	Nominal	-15	250	-38.4	-48.5	0	-72.2	15.85	18	0
G2D3	07/31/95	Nominal	-10.3	335	-36.2	-45.9	0	-72.26	20.02	16.1	0
G2E1	08/01/95	Nominal	-16.8	320	-43.9	-60.65	0	-71.85	20.41	7.6	0
G2E2	08/01/95	6	-6.4	40	-53.5	-65.7	0	-72	18.51	0	Many
R050-5	08/03/95	Nominal	-18.2	125	-32.2	-44.7	0	-72.19	16	24	0
R050-11	08/03/95	Nominal	-11.4	240	-51	-60.9	0	-71.8	18.9	1.9	Many
R085-9	08/03/95	Nominal	-17	105	-48.7	-59	0	-72.1	16.07	7.3	0
R085-10	08/03/95	6	-7.7	300	-48.6	-57.6	0	-72	23.4	0	Many
R085-12	08/02/95	Nominal	-18.7	270	-47.9	-59.7	0	-72.29	15.85	8.6	0
R085-13	08/02/95	Nominal	-14.9	70	-43.4	-54.5	0	-72.23	16.53	12.3	0
R085-16	08/02/95	Nominal	-16.3	313	-48.8	-60.3	0	-71.9	16.4	6.7	3
R110-9	08/09/95	Nominal	-15.2	150	-47.2	-58.9	0	-72.6	15.1	10.3	0
R110-10	08/09/95	Nominal	-12.2	290	-49.2	-59.9	0/1	-72.4	15.6	7.6	0
R110-14A	08/09/95	Nominal	-13.7	130	-45.9	-57.7	0	-72.6	15.5	11.2	0
R110-15	08/09/95	Nominal	-13.3	200	-52.5	-63.3	0	-72.5	15.4	4.6	0
R110-16	08/09/95	Nominal	-10.2	5	-55.5	-66.2	0	-72.6	16	1	Many

TERRESTRIAL ATV TEST DATA SUMMARY
CHANNEL 53
SUMMER 1995

		ATV SIGNAL									
SITE NO	DATE	TRANSMITTER POWER (dB)	TAP ENERGY (dB)	AZIMUTH (DEG)	SIGNAL LEVEL (dBm)	PILOT LEVEL (dBm)	COMB FILTER	NOISE FLOOR (dBm)	C/N (dB)	MARGIN (dB)	10 MIN SEGMENT SER
R185-14	08/04/95	Nominal	-17.7	210	-48.1	-59.8	0	-72.06	15.15	8.8	0
R215-11	08/04/95	Nominal	-13.5	180	-53.6	-66.9	0	-72.76	15.6	3.6	3
R270-10	08/10/95	Nominal	-7.3	335	-46.3	-60	1	-72.6	16.1	10.2	4
R270-11	08/10/95	Nominal	-9.3	30	-44.9	-55.2	0	-72.4	15.5	12	0
R270-12	08/10/95	6	-11.3	260	-57.2	-67.7	0	-72.5	15.3	0	Many
R270-14	08/07/95	Nominal	-14.7	335	-53.4	-65.9	0	-72	15.7	2.9	0
R270-15	08/07/95	Nominal	-17.7	65	-51.4	-63	0	-72	15.9	4.7	2
R270-16	08/07/95	Nominal	-16.5	345	-46.7	-58.9	0	-71.8	15.1	10	0
R300-9	08/11/95	Nominal	-15.4	50	-35.4	-46.2	0	-72.2	15.3	32.5	0
R300-10	08/11/95	Nominal	-16.6	210	-41.8	-51	0	-72.5	15.8	14.9	0
R305-14	08/08/95	Nominal	-15.9	330	-43	-54.2	0	-72.4	15.5	13.9	0
R300-15	08/08/95	Nominal	-16.6	115	-39.8	-52	0	-72.5	15.7	17	0
R300-16	08/08/95	Nominal	-13.7	190	-41.5	-53	0	-72.5	14.7	16.3	0
R305-2	07/28/95	Nominal	-12.3	200	-35.8	-48.6	0	-71.75	16.79	32.2	0
R305-8	07/28/95	Nominal	-12.2	245	-45.2	-56	0	-71.99	17.6	9.2	3

TERRESTRIAL ATV TEST DATA SUMMARY
CHANNEL 53
SUMMER 1995

ATV SIGNAL											
SITE NO	DATE	TRANSMITTER POWER (dB)	TAP ENERGY (dB)	AZIMUTH (DEG)	SIGNAL LEVEL (dBm)	PILOT LEVEL (dBm)	COMB FILTER	NOISE FLOOR (dBm)	C/N (dB)	MARGIN (dB)	10 MIN SEGMENT SER
H-1A	08/14/95	Nominal	-14.6	45	-34.7	-45.9	0	-71.6	15.6	51.3	0
H-1B	08/14/95	Nominal	-11.7		-36.1	-48.2	0	-71.55	14.4	41.1	0
H-2A	08/15/95	Nominal	-17	215	-32.6	-45	0	-71.6	16.5	46.5	0
H-2B	08/15/95	Nominal	-15.8		-32.8	-42.5	0	-69.5	15.6	30.1	0
H-3A	08/16/95	Nominal	-15.7	340	-33.7	-45.2	0	-71.8	15.5	27.6	5
H-3B	08/16/95	6	***	***	***	***	***	***	***	***	***
H-4A	08/16/95	Nominal	-17.1	250	-33.3	-45	0	-71.6	14.9	53.4	0
H-4B	08/16/95	Nominal	-10.1		-34.5	-48	1	-71.3	16	34.8	2
H-5A	08/17/95	Nominal	-16.1	30	-32.2	-45.1	0	-71.8	15.9	28.7	0
H-5B	08/17/95	Nominal	-13		-37.4	-50.3	0	-64.4	15.6	11.4	1
H-6A	08/21/95	Nominal	-12.5	260	-39	-49.3	0	-71.23	14.8	17.4	0
H-6B	08/21/95	6	-3.9		-32.8	-44.2	0	-62.52	29.72	0	500
H-7A	08/21/95	Nominal	-17.1	110	-36.4	-48.8	0	-71.51	14.98	46.1	0
H-7B	08/21/95	Nominal	-11.4		-30.6	-41	0	-66.66	16.6	23.5	0
H-8A	08/22/95	Nominal	-14.8	180	-33.7	-44.9	0	-71.6	15.4	32.5	0
H-8B	08/22/95	6	-2.5		-31.1	-43.8	0	-62.3	31.2	0	Many
H-9A	08/24/95	Nominal	-12.2	160	-35.2	-46.7	0		16	32.6	0
H-9B	08/24/95	6	***	***	***	***	***	***	***	***	***
H-10A	08/24/95	Nominal	-16.4	340	-35	-47.8			15.1	58.6	0
H-10B	08/24/95	Nominal	-15.4		-29.5	-41.3	0		18.7	49.7	1

*** Signal too weak to measure.

Cable Field Tests

Conducted by

Cable Television Laboratories, Inc.

(July 28 - August 29, 1995)

TABLE OF CONTENTS

1. INTRODUCTION AND GENERAL COMMENTS

The Cable portion of the Charlotte N. C. field tests was conducted by Cable Television Laboratories, Inc. (CableLabs) in accordance with the HDTV Test Procedures Manual - Field Tests of the Grand Alliance Prototype (SSWP2-1389 document). The tests were performed between 1995 July 27 and August 29 at 46 sites on eight Cable Systems, owned by Time Warner Cable.

The 19.3 Mb/s terrestrial HDTV signal was received off-air at each cable headend site by a Zenith 8-VSB receiver, error corrected and combined with a pseudo-random data stream to represent a second HDTV channel and modulated using a 16-VSB modulator. The signal was combined with the normal cable channels and carried 6 dB below the adjacent NTSC channel. Tests were performed at the extremities of the system using normal tap outputs feeding into the receiver after a 100 foot drop wire. Some of the tests included transmission of the HDTV signals over AM fibre links. The AML microwave links tested last year had been replaced with fibre links and were not available for the test.

The tests were performed in the CableLabs mobile test van by CableLabs, Philips and Zenith representatives. The tests included reference tests of NTSC signals plus the HDTV signal. Supplementary over-night tests of the off-air signal were performed to ensure an off-air HDTV signal could be received and error corrected at the headend locations.

The tests were coordinated with the channel 53 broadcast transmitter site and the field test truck to maximize the efficiency of both test groups. Local Cable System personnel assisted in setting up the headend equipment and locating the test points in the field.

We wish to thank the management and staff of the eight Cable Systems for the help they provided in the preparation and conduction of the tests. They were willing to work the long hours necessary to complete the tests and endure the questions from subscribers resulting from the different signals we were putting on the systems. In addition, we wish to thank PBS, the Grand Alliance members, and the many equipment suppliers who were responsible for the installation and operation of the transmitter site, without which the field tests could not have been performed.

The Grand Alliance acknowledges the efforts of CableLabs in conducting the cable portion of the Advisory Committee's program to confirm the performance of the Grand Alliance system in the field. CableLabs is to be commended for its efforts to develop the test program and for its effectiveness and diligence in managing and conducting the ensuing program.

In the opinion of the Alliance, the system performed well in the cable portion of the confirmation exercise. As is indicated in the report, some problems were encountered, but these tended to occur in marginal conditions. Further, the Alliance believes that some of the problems seen are indicative of limitations in the prototype hardware, rather than of limitations that are fundamental to the system itself.

2. TEST PROCEDURE SUMMARY

The HDTV broadcast channel 53 signal was received at each cable system headend by a Wade Antenna WL 30-83/S, 11 dBi gain, log periodic antenna, specifically mounted on the tower for the tests. The antennas were mounted sufficiently high on the tower to obtain a line of sight path to the transmitter. The received signal was split two ways with one signal feeding the HDTV receiver and the second signal feeding the spectrum analyzer. A 21 dB gain pre-amplifier was inserted ahead of the splitter at one distant headend (Rockingham @ 58+ miles) to improve the margin of the received HDTV signal.

The received 8-VSB HDTV signal was equalized, detected, error corrected and passed to the 16-VSB modulator. A pseudo-random data stream, representing a second HDTV channel and used for measuring bit error ratio at the receiver, was also fed into the 16-VSB modulator. The output of the modulator, representing two HDTV channels (a total of 38.6 Mb/s) within 6 MHz was available for insertion on the cable system.

The NTSC test signal was generated at the headend and fed to the NTSC modulator.

The equipment at the headend was remotely controllable to allow for the selection of the NTSC signals, the HDTV signal, a test sweep signal or no signal. The NTSC signal was generated at the headend and fed to the NTSC modulator. The test sweep signal was used to measure the 6 MHz test channel amplitude and group delay. The output levels were set to provide NTSC signals and the sweep signal at the same nominal level as the adjacent NTSC cable channel and the HDTV average signal power 6 dB below the NTSC average power during sync. The signal on the cable system between actual tests was normally the locally generated NTSC signal.

The test channel used on the cable system was determined by spectrum availability on the individual systems, with some tests performed above the design frequency of the system due to the system being fully loaded. Use of these upper channels sometimes caused the received signal at remote sites to be out of FCC specification.

Test points were selected at the ends of long trunk lines, after fibre links where available, and as deep into the distribution as possible. Many of the remote test sites were the same as used in last year's transmission subsystem field test. A 100' drop cable was attached to a tap and the signal fed to the test van.

The NTSC test signal was passed through a set top converter and fed into a TV set, checked for any visible impairments and graded on the CCIR impairment scale. The visual and aural carrier levels were measured plus the carrier-to-noise, carrier-to-composite triple beat and carrier to other beat product ratios, frequency response and group delay of the test channel. The signal was also passed through a sample of home wiring referred to as the house-in-a-box (HIAB), which simulated a poorly installed subscriber wiring system. It consisted of two four-way splitters in cascade with a 10 dB drop amp between the first and second splitter. The seven cables attached to the unused ports of the splitters varied in length from 31.5 to 114 feet and were terminated in shorts. With the 10 dB gain amplifier, the loss of the HIAB varied from 4 dB at 50 MHz to 7 dB at 300 MHz. The intent of the HIAB test was to determine if the HDTV service was available as long as the NTSC service, however poor, was available.

The NTSC signal was replaced with the HDTV signal, and fed directly to the 16-VSB HDTV receiver (which also included the transport decoder, video decoder, and audio decoder). The average power, signal-to-noise, and bit error ratio (BER) were measured. At the same time, the HDTV picture and audio quality were monitored for transmission impairments. White Gaussian noise was then added locally to the received signal until the BER reached the threshold of 3×10^{-6}, and the picture and audio once again were monitored. The signal-to-noise was re-measured and the margin to threshold was calculated as the difference between the received S/N and the S/N at the white noise error threshold. The signal was then fed through the house-in-a-box and the measurements repeated. The BER measurement consisted of three 20-second intervals. This test was performed on the signal as received as well as on the signal when white Gaussian noise was added to reach the error threshold for the margin calculation. During the test, variations in previously measured signal levels sometimes occurred, thus causing the calculated margins to be of the "worst case" variety. Some BER measurements show zero errors at threshold due to signal levels varying between the time the noise source injection level was set and the time the measurements were made.

3. TIME WARNER CABLE OF MECKLINBURG RESULTS SUMMARY

Test Dates: 1995 July 27 - July 28
Test Channel: 64 (460.75 - 466.75 MHz) HRC
System Bandpass: 50 - 750 MHz
Ch 53 HDTV Rx Level: -26 dBm (~35 dB of Margin)
Rx Site: 5 4 miles from transmitter

Site Number	A1	A2 Fibre	A3 Fibre	A4 Fibre	A5 Fibre
No of Trunk Amps	0	0	1	1	1
No of Line Extenders	0	0	0	3	3
Direct NTSC:					
Signal Level dBm	-39.5	-36.8	-47.8*	-41.0	-40.7
Rating	5	4.5	4.5	4	4
C/N (6 MHz) dB	44.4	46	43.6	45.2	35**
CTB ratio dB	-	66	55	58	63
C/Beat ratio dB	-	73	60	65	n/a
Freq. Response dB	0.6	1.5	.8	0.9	2
Group Delay nsec	30	75	70	44	110
HIAB NTSC:					
Signal Level dBm	-47.2*	-44.8	-55.7*	-49.1*	-48.9*
Rating	5	4	3	3.5	3.5
Freq. Response dB	0.8	1.5	n/a	1.2	2
Group Delay nsec	30	75	n/a	52	105
HDTV Direct Signal:					
Average power dBm	-44.7	-41.8	-53.8	-46.9	-46.8
C/N (6 MHz) dB	40.2	39.7	37.6	39.5	40.3
Margin dB	12.0	11.1	8.7	11.2	11.9
HDTV Through HIAB:					
Average power dBm	-52.8	-50	-61.9	-55.3	-55.3
C/N (6 MHz) dB	40.6	36.8	31.1	38.8	36.4
Margin dB	11.6	8.0	2.8	9.9	7.6

** Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver.*
*** C/N below FCC specification of 43 dB in 4 MHz (41.3 dB in 6 MHz).*
Site Number A1 is the headend test point.

ANALYSIS

The NTSC signal level was slightly below FCC level specifications at one location (A3) and C/N was below specification at another location (A5). Most of the HIAB signal levels were below FCC specification. The HDTV signal was received error free at all locations for both the direct path and the HIAB. The margin to threshold ranged from 2.8 dB (HIAB) to 12.0 dB (direct path) in the system. The lowest margin was due to the out-of-spec low signal level received. The system had installed AM fibre links since the previous tests, resulting in greatly reduced cascade lengths and improved performance The headend test point, A1, is not included in the analysis.

4. TIME WARNER CABLE OF KANNAPOLIS RESULTS SUMMARY

Test Dates: 995 July 31 - August 01
Test Channel: 25 (228 - 234 MHz) IRC
System Bandpass: 50 - 400 MHz
Ch 53 HDTV Rx Level: -48 dBm (~29 dB of Margin with 21 dB gain preamplifier)
Rx Site: 5.6 miles from transmitter

Note: HDTV receiver had low gain and required the pre-amplifier.

SITE NUMBER	B1	B2	B3	B4	B5	B6
No of Trunk Amps	0	36	34	25	34	32
No of Line Extenders	0	0	1	0	1	1
Direct NTSC:						
Signal Level dBm	-37.4	-37.8	-32.4	-35.1	-32.3	-23.4
Rating	5	4	4.5	4.5	4	3.5
C/N (6 MHz) dB	51.9	50.9	42.2	41.3	42.2	41.7
CTB ratio dB	>70	>53	52	55	53	52
C/Beat ratio dB	>70	>53	>63	>456	62	60
Freq. Response dB	0.5	1	1	1	0.7	1.6
Group Delay nsec	314	300	300	250	100	250
HIAB NTSC:						
Signal Level dBm	-41.0	-41.4	-38.6	-38.7	-36.2	-27.1
Rating	5	4	4	4.5	3.5	3.5
Freq. Response dB	1	1	1	1	1	2.2
Group Delay nsec	300	300	300	300	100	250
HDTV Direct Signal:						
Average power dBm	-43.8	-43.8	-35.0	-41	-38.2	-30.3
C/N (6 MHz) dB	41.2	37.4	35.0	37.2	36.1	35
Margin dB	13.0	9.0	6.9	9	7.6	6.3
HDTV Through HIAB:						
Average power dBm	-47.3	-47.1	-42.1	-44.3	-41.9	-33.7
C/N (6 MHz) dB	40.2	36.4	35.9	37	35.5	35.1
Margin dB	11.9	8.1	7.7	8.7	6.7	6.4

Site Number B1 is the headend test point

ANALYSIS

The HDTV receiver worked error free in all test locations and had 6.9 dB of margin after 34 trunk amplifiers and one line extender. A slight inband beat (-53 dBc) was seen at all the remote sites, but had no effect on the HDTV receiver. The headend test point, B1, is not included in the analysis.

5. VISION CABLE OF ALBEMARLE RESULTS SUMMARY

Test Dates: 1995 August 02 - August 03
Test Channel: 51 (384 - 390 MHz) IRC
System Bandpass: 50 - 400 MHz
Ch 53 HDTV Rx Level: -42 dBm (~34 dB margin)
Rx Site: 24.2 miles from transmitter

SITE NUMBER	C1	C2 (FIBRE)	C3 (FIBRE)	C4 (FIBRE)	C5 (FIBRE)	C6 (FIBRE)
Number of Trunk Amps	0	9	12	24	12	41
Number of Line Extenders	0	2	0	2	2	0
Direct NTSC :						
Signal Level dBm	-35.4	-39.3	-41.0	-42.3	-42.6	-38.7
Rating	4.5	4	4	3	2.5	4
C/N (6 MHz) dB	52.8	47.8	45.8	37**	42.0	41.9
CTB ratio dB	>65	60	>65	>56	55	57
C/Beat ratio dB	>65	60	59	55	55	56
Freq. Response dB	0.2	3.2	0.5	1.5	1.5	0.8
Group Delay nsec	100	300	200	150	100	75
HIAB NTSC:						
Signal Level dBm	-40.8	-44.8	-46.6	-47.4*	-47.9*	-44.3
Rating	4.5	3.5	3.5	3	2	4
Freq. Response dB	1.0	2.5	1.2	0.9	2.0	1.4
Group Delay nsec	150	250	200	150	100	80
HDTV Direct Signal:						
Average power dBm	-41.6	-45.7	-46.6	-48.7	-49.9	-45.0
C/N (6 MHz) dB	46.9	41.1	40.7	32.4	35.1	35.4
Margin dB	18.2	12.0	11.2	2.4	4.8	6.0
HDTV Through HIAB:						
Average power dBm	-46.7	-50.8	-50.2	-53.9	-55.5	-51.0
C/N (6 MHz) dB	40.7	34.8	32.1	30.4	29.7	30.7
Margin dB	11.9	5.6	2.5	0	0	1.7

**Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver.*
*** C/N below FCC specification of 43 dB in 4 MHz (41.3 dB in 6 MHz).*
Site Number C1 is the headend test point.

ANALYSIS

All remote sites were fed via fibre backbone. All direct sites had error-free HDTV operation and had margin. Two of the HIAB sites (C4 & C5) were either just above or just below threshold, respectively, due to out-of-spec signal levels plus inband beats (35 dB D/U). These inband beats, which were seen at all the remote test sites primarily at the HIAB output, degraded the NTSC picture as well. The inband beats may have been from oscillations in the HIAB. The headend test point, C1, was not included in the analysis.

6. TIME WARNER CABLE OF ROCKINGHAM RESULTS SUMMARY

Test Dates: 1995 August 03 - 04
Test Channel: 43 (336 - 342 MHz) Standard
System Bandpass: 50 - 350 MHz
Ch 53 HDTV Rx Level: -31.5 dBm (~34 dB of Margin with preamplifier)
Rx Site: 58.5 miles from transmitter

SITE NUMBER	D1	D2	D3	D4	D5
No of Trunk Amps	0	21	25	40	32
No of Line Extenders	0	0	1	0	0
Direct NTSC:					
Signal Level dBm	-35.2	-44.7*	-48*††	-47.1*	-44.5*
Rating	4	4	3.5	3	3.5
C/N (6 MHz) dB	45.0	37.5**	36.8**	36.3**	40.4**
CTB ratio dB	68	60	57	57	58
C/Beat ratio dB	68	62	41†	39†	>60
Freq. Response dB	1.2	2.7	2.5	4.5	2.2
Group Delay nsec	50	50	90	65	90
HIAB NTSC:					
Signal Level dBm	-40.8	-49.8*	-43.4††	-52.6*	-50.2*
Rating	4	3.5	3.5	3	3.5
Freq. Response dB	1.0	2.2	2.5	4.5	2.4
Group Delay nsec	50	75	65	60	90
HDTV Direct Signal:					
Average power dBm	-41.9	-51.9	-53.4††	-54.6	-51.5
C/N (6 MHz) dB	42.3	32.3	31.0	29.4	32.5
Margin dB	12.5	2.2	0.8	0	1.8
HDTV Through HIAB:					
Average power dBm	-47.5	-57	-60.3††	-60.0	-57.2
C/N (6 MHz) dB	34.4	26.2	28.7	27.4	33.2
Margin dB	5.6	0.6	0	0	1.3

** Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver.*
*** C/N below FCC specification of 43 dB in 4 MHz (41.3 dB in 6 MHz).*
† Carrier to beat below FCC specification of 51 dB.
†† The received signal levels varied significantly during the test.
Site Number D1 is the headend test point.

ANALYSIS

The test channel was located above the highest frequency channel used on the system and where the system was not normally checked for frequency response. This resulted in some remote test points having a system response that was rolled off as well as out-of-spec signal levels at all remote sites. All direct sites were at or above threshold (good video & audio), with the limiting factor being not only the low siganl level, but inband beats (33 dB D/U ratio for the HDTV signal). The beats were clearly seen in the NTSC video. Two of the HIAB sites were below

threshold due to the low signal level and beats. This is an example of utilizing the spectrum above the normal system bandwidth for data signals. The headend test point, D1, is not included in the analysis.

7. TIME WARNER CABLE OF MONROE RESULTS SUMMARY

Test Dates: 1995 August 21 - 22
Test Channel: 38 (306 - 312 MHz) Standard
System Bandpass: 50 - 300 MHz
Ch 53 HDTV Rx Level: -44 dBm (~31 dB of Margin)
Rx Site: 19.6 miles from transmitter

SITE NUMBER	E1	E2	E3 (FIBRE)	E4	E5 (FIBRE)	E6 (FIBRE)
No of Trunk Amps	0	26	25	29	33	22
No of Line Extenders	0	0	1	0	0	0
Direct NTSC:						
Signal Level dBm	-29.1	-39.5	-55.4*	-42.4	-46.5*	-51.7*
Rating	4.5	4	3.5	3.5	3	3.5
C/N (6 MHz) dB	43.6	45.9	37.5**	42.2	40.8**	39.6**
CTB ratio dB	>90	74	53	59	>59	>57
C/Beat ratio dB	>90	>75	53	>62	>59	>57
Freq. Response dB	0.5	1.2	0.5	2.0	2.0	3.5
Group Delay nsec	10	60	55	n/a	n/a	n/a
HIAB NTSC:						
Signal Level dBm	-33.3	-43.7	-59.5*	-46.7	-50.2*	-56.0*
Rating	4.5	4	3	3	3	3
Freq. Response dB	1.8	2.0	2.5	n/a	n/a	n/a
Group Delay nsec	25	70	70	n/a	n/a	n/a
HDTV Direct Signal:						
Average power dBm	-35.5	-46.8	-61.7	-48.2	-54.6	-54.7
C/N (6 MHz) dB	46.6	38.6	31.5	34.5	32.6	30.6
Margin dB	17.9	10.1	2.0	5.4	3.1	1.8
HDTV Through HIAB:						
Average power dBm	-40.4	-51.9	-66.4	-52.9	-60.0	-60.1
C/N (6 MHz) dB	41.8	38.9	25.6	34.2	31.5	31.6
Margin dB	13.1	7.1	0	4.5	0.8	1.7

**Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver.*
*** C/N below FCC specification of 43 dB in 4 MHz (41.3 dB in 6 MHz).*
Site Number E1 is the headend test point.

ANALYSIS:
The test channel was two channels above the design frequency of the cable system. Three test points had signal levels and C/N ratios below FCC specifications, but the HDTV receiver operated error free at all the locations when fed directly and was below threshold at one location after the HIAB (signal level 14 dB below spec). The three fibre runs had trunk amplifier cascades that ranged from 22 to 33, and had operating margins despite having out-of-spec signal levels. The headend test point, E1, is not included in the analysis.

8. TIME WARNER CABLE OF GASTONIA RESULTS SUMMARY

Test Dates: 1995 August 22 - 23
Test Channel: 44 (342 - 348 MHz) Standard
System Bandpass: 50 - 330 MHz
Ch 53 HDTV Rx Level: -48 dBm (~33 dB of Margin)
Rx Site: 30.5 miles from transmitter

SITE NUMBER	F1	F2	F3	F4	F5	F6
No of Trunk Amps	1	38	43	31	29	22
No of Line Extenders	0	0	0	0	0	0
Direct NTSC:						
Signal Level dBm	-29.7	-57.8*	-55.9*	-54.4*	-51.0*	-47.3*
Rating	4.5	3	3.5	3	2.5	3.5
C/N (6 MHz) dB	50.7	34.8**	35.2**	37.1**	39.3**	37.5**
CTB ratio dB	>74	>47	>52	57	56	56
C/Beat ratio dB	>74	45†	48†	50†	50†	56
Freq. Response dB	0.4	3.5	4.5††	4.5††	4.0	2.2
Group Delay nsec	15	75	72	165	67	63
HIAB NTSC:						
Signal Level dBm	-35.6	-64*	-62.0*	-61.0*	-58.0*	-54.0*
Rating	4	2.5	2	2.5	2.5	3
Freq. Response dB	1.2	2.5	3.0	3.5	3.0	1.5
Group Delay nsec	36	210	85	180	90	70
HDTV Direct Signal:						
Average power dBm	-35.8	-64.9	-64.5	-62.0	-58.7	-53.7
C/N (6 MHz) dB	42.0	27.1	27.6	29.4	32.0	30.5
Margin dB	13.2	0	0	0	2.4	1.5
HDTV Through HIAB:††						
Average power dBm	-41.6	-70.5	-70.7	-68.5	-64.8	-60.4
C/N (6 MHz) dB	38.5	17.8	17.3	23.8	23.9	26.4
Margin dB	8.3	0	0	0	0	0

** Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver.*
*** C/N below FCC specification of 43 dB in 4 MHz (41.3 dB in 6 MHz).*
† Exceeds FCC specification of 51 dB
†† Exceeds FCC specification of 4 dB
Site Number F1 is the headend test point.

ANALYSIS

The test channel was well above (3 channels) the design frequency of the system. The signal levels and C/N ratios were well below FCC specifications at ALL locations and some of the test points exhibited severe tilt across the 6 MHz the test channel. As a result, the HDTV receiver worked without errors at only two test points (a third was at threshold) when fed directly and did not work when fed through the house in a box. This is a demonstration of attempting to use a channel too far above the design frequency of the system, however, it is possible that the channel could be used with an 8-VSB signal. The headend test point, F1, is not included in the analysis.

9. TIME WARNER CABLE OF SHELBY RESULTS SUMMARY

Test Dates: 995 August 24 - 25
Test Channel: 0 (192 - 198 MHz) IRC
System Bandpass: 50 - 350/450 MHz
Ch 53 HDTV Rx Level: -63 dBm (~20 dB of Margin with 21 dB gain preamplifier)
Rx Site: 49.0 miles from transmitter

SITE NUMBER	G1	G2	G3	G4	G5
Number of Trunk Amps	0	25	47	28	31
Number of Line Extenders	0	2	1	1	0
Direct NTSC:					
Signal Level dBm	-45.8*	-42.0	-28.0	-34.7	-41.3
Rating	4.5	3.5	3.5	4	3.5
C/N (6 MHz) dB	45.4	37.0**	39.1**	41.1**	40.4**
CTB ratio dB	>69	54	58	>60	>57
C/Beat ratio dB	64	>56	57	>60	>57
Freq. Response dB	0.8	0.5	1.0	0.5	0.7
Group Delay nsec	30	90	160	180	120
HIAB NTSC:					
Signal Level dBm	-49.2*	-45.7	-30.9	-37.9	-44.5
Rating	4	3	3.5	4	3.5
Freq. Response dB	0.8	0.8	1.0	1.0	0.9
Group Delay nsec	80	100	140	170	170
HDTV Direct Signal:					
Average power dBm	-51.8	-48.5	-33.9	-40.5	-47.8
C/N (6 MHz) dB	41.0	35.2	33.2	35.2	36.8
Margin dB	12.4	5.6	4.5	6.6	7.4
HDTV Through HIAB:					
Average power dBm	-55.2	-51.7	-37.0	-43.8	-55.0
C/N (6 MHz) dB	35.6	33.3	32.3	34.7	33.5
Margin dB	7.0	5.0	3.9	6.1	4.7

** Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver.*
*** C/N below FCC specification of 43 dB in 4 MHz (41.3 dB in 6 MHz).*
Site Number G1 is the headend test point.

Special Note: At the time of testing at test point G5, the HDTV signal passed through an ATM network prior to being broadcast, received, and carried on cable. There were no visible transmission errors during the tests.

ANALYSIS

The HDTV receiver worked at all locations without errors, even though the signal to noise was below specifications at all the remote sites. The margin at the furthest test site, 47 trunk amplifiers and 1 line extender, was 3.9 dB after the HIAB. The headend test point, G1, is not included in the analysis.

10. TIME WARNER CABLE OF CHARLOTTE RESULTS SUMMARY

Test Dates: 1995 August 28 - 29
Test Channel: 62 (450 - 456 MHz) Standard
System Bandpass: 50 - 750 MHz
Ch 53 HDTV Rx Level: -37 dBm (~31 dB of Margin)
Rx Site: 7.0 miles from transmitter

SITE NUMBER	H1	H2 FIBRE	H3 FIBRE	H4 FIBRE	H5 FIBRE	H6 FIBRE	H7 FIBRE
Number of Trunk Amps	0	1	2	3	0	1	1
Number of Line Extenders	0	2	0	3	3	3	2
Direct NTSC:							
Signal Level dBm	-47.0	-44.8*	-43.6	-43.6	-38.2	-38.8	-45.1*
Rating	4.5	4.5	4.5	3	4	4	4.5
C/N (6 MHz) dB	41.6	45.2	44.9	43.9	45.5	42.9	44.6
CTB ratio dB	>36	60	62	62	65	60	59
C/Beat ratio dB	>36	>64	62	53	61	59	61
Freq. Response dB	0.4	0.4	0.5	1.5	0.4	0.9	0.8
Group Delay nsec	190	150	840	250	160	200	200
HIAB NTSC:							
Signal Level dBm	-54.7*	-52.8*	-51.5*	-51.5*	-46.2	-46.7	-52.9*
Rating	3.5	4	4	3	4	4	4
Freq. Response dB	0.5	0.8	0.7	1.2	1.0	1.5	1.0
Group Delay nsec	150	150	320	230	200	150	240
HDTV Direct Signal:							
Average power dBm	-53.4	-51.1	-50.0	-49.6	-44.4	-45.3	-51.6
C/N (6 MHz) dB	38.3	38.9	38.6	38.0	41.6	34.1	37.3
Margin dB	9.7	10.1	9.8	8.6	13.1	6.2	8.0
HDTV Through HIAB:							
Average power dBm	-61.4	-58.9	-58.0	-58.0	-52.4	-53.2	-59.5
C/N (6 MHz) dB	31.2	32.9	33.3	33.1	38.1	33.9	31.7
Margin dB	2.6	4.3	4.7	3.6	9.1	5.5	2.5

** Level below FCC minimum level of -44 dBm at end of 100' drop or -47 dBm into a receiver. Site Number H1 is the headend test point.*

ANALYSIS

The system has just converted from AML microwave feeds to AM fibre links, which is why the number of trunk amplifiers is small. Many of the areas have completed channel expansion but the process is not complete. The signal level was slightly below FCC specifications at two locations. The HDTV receiver operated error free at all locations, and had good margin when fed the signal directly. This is a good example of a system upgrade to fibre. The headend test point, H1, is not included in the analysis.

11. SUMMARY AND ANALYSIS

The Grand Alliance high data rate 16-VSB, cable mode HDTV system was tested in Charlotte N.C. between 1995 July 27 and August 29 to determine its ruggedness and ensure it would operate on existing Cable television systems. The complete 16-VSB receiver (modem plus video/audio) was tested at a total of 46 receive sites (8 headend locations and 38 remote locations) in eight Cable systems, over long amplifier cascades and AM fibre links and in some systems one to three channels beyond the Cable system design bandwidth. The source of the HDTV video and audio was an 8-VSB terrestrial broadcast signal (CH 53) that was also used for terrestrial field testing being performed concurrently.

The 16-VSB HDTV receiver worked at all locations where the delivered signal met FCC specifications, and at many sites where it did not. Some systems were tested at frequencies beyond their maximum design frequency, resulting in less than FCC-spec conditions. Also, strong inband beats were observed on some systems that affected both the NTSC and the HDTV signals. The HDTV receiver continued to operate in these situations until the carrier-to-noise threshold of the receiver was reached.

The video decoder occasionally exhibited a flashing effect for some period of time after turn on. The effect was significantly different from transmission errors and was noted under video comments as flashing. The effect would normally only last for a couple minutes.

The 8-VSB terrestrial HDTV signal was received off-air at each headend site and was always strong enough (>20 dB margin) to be able to deliver error-free data to the 16-VSB modulator at the Cable headend.

The 16-VSB modulation scheme, with the HDTV average signal power 6 dB below NTSC peak sync power, was able to deliver a high data bit rate (38.6 Mb/s net) over the cable system and to the test receivers located at the extremes of the cable system. The HDTV receiver worked in the direct path at all locations that met FCC signal level and C/N ratio specifications, including over fibre optic links. Some of the cable systems were tested at frequencies above their equipment's maximum design frequency, which resulted in reduced levels and/or significant inband channel tilt. The HDTV receiver continued to operate at these out-of-spec locations in the direct path until the point was reached that the low signal levels and large channel tilts caused the carrier-to-noise threshold of the receiver to be reached. Also, the margin calculations are considered to be "worst case" for each test site due to varying signal conditions that occur during the course of the test.

APPENDIX 1

Time Warner Cable of Mecklinburg

General System Information

Total Subscribers: 54,000	Miles of Plant: 1500	Percent Underground: 60
System Bandwidth: 50 - 750 MHz	Frequency Plan: HRC	Highest Freq. Used: 499 MHz
Test Channel: 64 (460.75 - 466.75 MHz)	Lower Channel: Scrambled	Upper Channel: None
Trunk Amp Mfr.: Jerrold	Operating Carrier Levels: 47 dBmV.	
Line Extender Mfr.: Jerrold	Operating Carrier Levels: 47/38 dBmV.	
Trunk Cable: .750"	Cable Manufacturer: Trilogy	Age: 7
Distribution Cable: .650"	Cable Manufacturer: Trilogy	Age: 7
Cable Tap & Passives Mfr.: Jerrold		
Channel 53 HDTV Rx Level: -26 dBm (~35 dB of Margin)		
Rx Site: 5.4 miles from transmitter		
Tests Performed By: G. Hovland - CableLabs, W O'Grady - Philips, and R. Densler & G. Sgrignoli - Zenith		
Director: Brian James - CableLabs		

Test Point A1

Date: 95 July 27 Address of Location: Headend, Mint Hill
Tap Location: HE Test Point Trunk Cascade: 0 Line Extender Cascade: 0

Field Test Results

1. NTSC Direct: Received Signal Level: -39.5 dBm
   Impairment Rating: 5 Comments: -
   Direct Inband Response: 0.6 dB P-V Delay: 30 ns

2. NTSC Through House-in-a-Box: Level: -47.2 dBm HIAB Loss: 7.7 dB
   Impairment Rating: 5 Comments: -
   HIAB Inband Response: 0.8 dB P-V Delay: 30 ns

3. NTSC Carrier levels (Direct):

Lower Visual:		-39.1 dBm	Lower Aural:	-59.4 dBm	Ratio: 20.3 dB
Test Visual:	-39.5 dBm	Test Aural:	-61.5 dBm	Ratio: 22 dB	
Upper Visual:		- dBm	Upper Aural:	- dBm	Ratio: - dB

4. NTSC Carrier Level: -6 dBm (after amplifier and filter)
   Highest Inband Spurious: - dBm @ - MHz
   CTB Level: - dBm
   Carrier-to-Noise: 44.4 dB (6 MHz bandwidth)
   Total System Response: 4 dB Peak-to-Valley Tilt across system: 3 dB

5. Direct Connection: HDTV Received Power: -44.7 dBm
   HDTV BER: 0 0 0
   Visual Impairment Comments: No trans. errors
   Aural Impairment Comments: No trans. errors
   HDTV Signal (amplified): -13.5 dBm Noise Power: -53.7 dBm S/N_1: 40.2 dB

   BER with noise added to reach threshold: 1.84E-06 2.28E-06 2.18E-06
   HDTV Signal (amplified): -13.5 dBm Noise Power: -41.7 dBm S/N_2: 28.2 dB

   Margin S/N_1 - S/N_2 : 12 dB

6. Signal through House-in-a-Box: HDTV Received Power: -52.8 dBm
   HDTV BER: 0 0 0
   Visual Comments: No trans. errors - flashing
   Aural Comments: No trans. errors
   HDTV Signal (amplified): -14.7 dBm Noise Power: -55.3 dBm S/N_1: 40.6 dB

   BER with noise added to reach threshold: 3.32E-07 1.60E-07 7.80E-08
   HDTV Signal (amplified): -14.7 dBm Noise Power: -43.7 dBm
   S/N_2: 29 dB

   Margin S/N_1 - S/N_2 : 11.6 dB

Test Point A2

Date: 95 July 28 Address of Location: 11019 Clayford Ridge, Mint Hill
Tap Location: Fibre/Buried Trunk Cascade: 0 Line Extender Cascade: 0

Field Test Results

1. NTSC Direct: Received Signal Level: -36.8 dBm
   Impairment Rating: 4.5 Comments: -
   Direct Inband Response: 0.8 dB P-V Delay: 55 ns

2. NTSC Through House-in-a-Box: Level: -44.8 dBm HIAB Loss: 8 dB
   Impairment Rating: 4 Comments: -
   HIAB Inband Response: 1.5 dB P-V Delay: 75 ns

3. NTSC Carrier levels (Direct):
   Lower Visual: -34.9 dBm Lower Aural: -54.6 dBm Ratio: 19.7 dB
   Test Visual: -35.8 dBm Test Aural: -58 dBm Ratio: 22.2 dB
   Upper Visual: - dBm Upper Aural: - dBm Ratio: - dB

4. NTSC Carrier Level: -2 dBm (after amplifier and filter)
   Highest Inband Spurious: -75 dBm @ 463.7 MHz
   CTB Level: -68 dBm
   Carrier-to-Noise: 46 dB (6 MHz bandwidth)
   Total System Response: 0 dB Peak-to-Valley Tilt across system: 2 dB

5. Direct Connection: HDTV Received Power: -41.8 dBm
   HDTV BER: 0 0 0
   Visual Impairment Comments: No trans. errors
   Aural Impairment Comments: No trans. errors
   HDTV Signal (amplified): -8.3 dBm Noise Power: -48 dBm S/N_1: 39.7 dB

   BER with noise added to reach threshold: 1.50E-07 9.93E-07 2.10E-07
   HDTV Signal (amplified): -8.3 dBm Noise Power: -36.9 dBm S/N_2: 28.6 dB

   Margin S/N_1 - S/N_2 : 11.1 dB

6. Signal through House-in-a-Box: HDTV Received Power: -50 dBm
   HDTV BER: 0 0 0
   Visual Comments: No trans. errors
   Aural Comments: No trans. errors
   HDTV Signal (amplified): -17.2 dBm Noise Power: -54 dBm S/N_1: 36.8 dB

   BER with noise added to reach threshold: 4.07E-07 1.70E-07 5.39E-07
   HDTV Signal (amplified): -17.2 dBm Noise Power: -46 dBm
   S/N_2: 28.8 dB

   Margin S/N_1 - S/N_2 : 8 dB