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OFFICE OF THE SECRETARY

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IS/WP2-0249
22 OCT 92

ADVISORY COMMITTEE ON ADVANCED TELEVISIONS SERVICE
IMPLEMENTATION SUBCOMMITTEE
WORKING PARTY 2 - TRANSITION SCENARIOS
MINUTES OF FORTY-FOURTH MEETING 10/14/92

87-268

1. The meeting was called to order by Vice Chairman, Merrill Weiss, at 10:15 A.M. at PBS in Alexandria, VA.

2. The agenda was adopted as issued.

3. The minutes of the 9/15/92 meeting were approved with the following changes:

   Item 6 - change to read "Jim Kutzner noted that the transmitter survey document did not recognize that full power stations might opt to begin service at lower power and did not include requirements for transmitters and antennas for translators and LPTV's."

   Item 7 - change 9:00 AM EST to 10:00 AM EST.

4. A list of attendees is attached.

5. Review of Action Items.

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   a, b, c) Continue as action items.

   d) Complete.

6. Final Report preparation.

   Jim Kutzner provided an updated draft of the final report as modified during the 10/10/92 conference call. Jim reviewed the structure of the document for those not having participated in the conference call and noted that some survey results are still pending. Considerable discussion took place on if and how economic constraints that may impact the ATV transition should be included in the final report. Responsibilities for rewriting various sections of the document were assigned as follows:

   Chief Engineers Survey - Charles Heuer
   Local Area Groups - Dave Folsom
   Equipment Manufacturers Survey - Dave Folsom
   Consumer Electronics Summary Report - Merrill Weiss.

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List A B C D E

It was agreed that a page would be added to the final report referencing key IS/WP2 documents.

Conference calls scheduled to continue work on the final report are as follows: 10:00 AM EST October 21st, 28th and November 4th, 11th, 18th.

7. Local Area Group Update.

Dave Folsom stated that he has received no new inputs and has had difficulty in getting follow-up responses from the new Local Area Groups. He will continue to solicit feedback.

8. Proponent Responses.

Merrill Weiss reviewed additional responses that have been received from Proponents concerning IS/WP2 questions on power levels and distributed transmission. The referenced documents are IS/WP2-0244 (Zenith), IS/WP2-0245 & IS/WP2-0246 (ATRC), IS/WP2-0247 (GI). The ATRC document from Philips (IS/WP2-0246) included calculations which concluded that no significant average power differences exist among the digital proponents. After some discussion, it was agreed that this document will be sent to the other proponents for comment and agreement. Merrill Weiss will follow up.

9. Distributed Transmission Study.

Merrill Weiss reported that no inputs have been received to date, but SS/WP1 has been having conference calls on this issue and expects to have a report available in about two weeks. This issue will be reviewed in a future conference call after the information is available.

10. Professional Equipment Survey.

Dave Folsom reported that the survey has been mailed, but no inputs have as yet been received. The cover letter sent with the survey is shown in attachment IS/WP2-0243.

11. Antenna/Transmitter Survey LPTV Supplement.

Merrill Weiss will make modifications to the Antenna/Transmitter Survey document clarifying the issue of LPTV's.

12. Comparative Analysis of Systems.

Merrill Weiss distributed version 1.2 of the document reflecting changes agreed upon at the 9/15/92 IS/WP2 meeting. This document will be reviewed during a future conference call.

13. New Business.

Merrill Weiss distributed for the Working Party's information an HDTV market study of TV stations conducted by Micro Communications, Inc. IS/WP2-0248.

14. Summary of Action Items.

a) Complete draft of comparative analysis of proponent responses. - Merrill Weiss

b) Send letter to Proponents summarizing adaptive coding proposal. - Merrill Weiss

c) Prepare addendum on LPTV for Antenna/Transmitter survey. - Merrill Weiss

d) Follow up on inputs from new Local Area Groups. - Dave Folsom

e) Write summary report on Consumer Electronics Survey. - Merrill Weiss

f) Send Philips document on average power calculations to other proponents. - Merrill Weiss

15. An agenda for the 11/17/92 meeting was prepared.

16. The next meeting is scheduled as follows:

Thursday, November 19, 1992
10:00 A.M.
PBS
Conference Room 6A
1320 Braddock Place
Alexandria, VA

Due to the amount of work that needs to be completed, a decision will be made during the planned conference calls on whether or not to extend the meeting to include Friday, November 20, 1992.

17. The meeting was adjourned at 3:45 P.M.

FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE
WORKING PARTY ON TRANSITION SCENARIOS
(WP2)

Wednesday, October 14, 1992
10:00 A.M.
PBS
Conference Room 2A
1320 Braddock Place
Alexandria, VA

AGENDA

1. Adoption of Agenda.
2. Approval of 9/15/92 Minutes.
3. Review of Action Items.
4. Final Report Preparation.
5. Local Area Group Update.
6. SS/WP1 Distributed Transmission Study.
7. Professional Equipment Survey.
8. Antenna/Transmitter Survey LPTV Supplement.
9. Comparative Analysis of Systems.
10. New Business.
11. Conclusions and Action Items.
12. Agenda for Next Meeting.
13. Next Meeting.

TRANSITION SCENARIOS

WP-2

October 14, 1992

NAME	COMPANY	ADDRESS	PHONE
LARRY COCHRAN	THOMSON	600 N. SHERMAN INDPLS IND 46201	317-267-5946 317-231-4226 (F)
S. Merrill Weiss	Consultant	25 Mulberry Lane - Edison, NJ 08820-2908	(908) 906-0907 Phone & FAX
JOE WIDOFF	FTC	1330 BRADDOCK PL. ALEX. VA 22314	703-739-5850 (PH) 5230 (FAX)
ANN HAGEMANN	HDN INT'L	226 N. ROYAL ST. ALEX VA 22314	703 548-1428 / fax 703 548 8067
JOHN HIDLE	Philips	345 Scarborough Rd. Briarcliff Manor NY 10510	914 945 6376 FAX 914 945 6500
James Kutzner	PBS	1320 Braddock Place Alexandria VA 22314	Phone (703) 739-5423 Fax 739-8938
CHARLES HEUER	ZENITH	1000 MILWAUKEE AVE GLENVIEW ILL 60025	708-391-8531 W 708-835-2683 H
Alan Stillwell	FCC	2000 M Street, N.W. Washington, DC 20554	202-653-8162 (Ph.) 202-653-8723 (FAX)
DAVE FOLSOM	PROVIDENCE JOURNAL WEBECH	1001 WOODRIDGE CIR CHARLOTTE NC 28217	(704) 329-7632 FAX (704) 357-4980
PAUL MESENER	WR&F	1776 K ST NW WASHINGTON DC 20006	202-828-7506 / 202-429-7049 (F)
CHUCK WILK	CPB	901 E ST., NW, " " 20004	(202)-879-9673 (202)-783-1019

-2/WPL-0243
14 OCT 92

FCC Advisory Committee on Advanced Television Systems Implementation Subcommittee Working Party 2 on Transition Scenarios (IS/WP-2)

Video Products Manager
Abekas Video Systems
101 Galveston Drive
Redwood City, CA 94063

October 5, 1992

Dear Sir,

As you may no doubt already know, the FCC Advisory Committee on Advanced Television Service (ACATS) was established by the FCC in 1987 to investigate and advise the FCC on any technological and public policy issues in regard to the emerging Advanced Television technologies. To accomplish that goal, this Committee established a series of three Subcommittees to investigate Planning, Systems and Implementation issues in regard to adoption and implementation of an Advanced Television transmission standard. Furthermore, within these Subcommittees are a series of Working Parties that do the specific investigative work deemed necessary by their parent Subcommittee. Specifically, within the ACATS is the Implementation Subcommittee, Working Party 2 whose mandate is to investigate those technological and public policy issues associated with the transition from the present NTSC transmission system to one involving Advanced Television. Additionally, IS/WP-2 is looking at the various proponents' ATV systems to see if any of the differences in the systems would have an impact on this transition.

To help in identifying possible critical path related equipment issues, IS/WP-2 has created a list of equipment it deems vital to the initial start-up of this new service. Your company has been selected as a possible manufacturer for the equipment listed below:

Character Generators

I have been asked on behalf of the IS/WP-2 to write and obtain the answers to a few questions that will aid in identifying these critical path items. We are aware that the answers to these questions speak to competitive issues. As a result, let me assure you that your specific answers to these questions will be kept confidential and will only be used with other industry based data to determine the availability of key products and services. More specifically, your specific answers will not be divulged or used in any way that might indicate what your marketing or manufacturing plans might be to possible competitors. In that context it is important to the work of IS/WP-2 though that we can advise the FCC on the possible complicating factors that may delay the implementation of Advanced Television in the timetable set forth in their latest Notice of Proposed Rule Making.

To that end, the Working Party created two simple possible television station functional diagrams with signal descriptions that I have attached for your perusal. The first functional diagram is marked as "Transitional" that includes more switcher and videotape capability than the "Minimal" version also included with this letter. Hopefully, your company is familiar with the characteristics of the five ATV proponent systems that are now being evaluated at the Advanced Television Test Center. All of these proponents have indicated to IS/WP-2 that they believe that at least in this initial stage of implementation of ATV as shown by the attached diagrams the signal will remain in some form of the compressed mode during processing and switching. Given the information you have available to you would you take the time to answer the following:

1. Do you anticipate the possibility of your company manufacturing (any of) the product(s) listed above? (Yes/No What Products?)

2. If your company were to produce this (or any of these) product(s), assuming you have sufficient technical data at the time of proponent system selection to begin design work, when would you anticipate being able to deliver this (these) product(s). (Quarter/Year)

3. Given this time of initial delivery, do you anticipate any factors that might delay delivering quantities of product sufficient to meet demand? (i.e. custom LSI availability etc.)
4. Do you have any indication based on what you now know of the various proponent systems, if their is any characteristic contained in any one particular proponent system that would either advance or delay the possible delivery schedule for these products? (i.e. analog vs. digital, progressive vs. interlace etc.)

As the time to our final report to the FCC draws near I would appreciate your answers to these questions as soon as possible. Please send the answers to your questions in the form of a short letter or fax addressed to me at the address or fax number indicated below. As I have stated earlier, this information is vital to the FCC's decision making process. Your prompt cooperation would be greatly appreciated.

You can reach me at anytime at (704) 329-3632 or FAX (704) 357-4980.

Sincerely,

David Folsom
Director of Engineering
WCNC-TV
Providence Journal Broadcasting
1001 Woodridge Center Drive
Charlotte NC 28226-1901

IS/WP2-0244
14 OCT 92

ZENITH

ZENITH ELECTRONICS CORPORATION □ 1000 MILWAUKEE AVENUE □ GLENVIEW, ILLINOIS 60025-2493 □ (708) 391-7000

October 12, 1992

Mr. Merrill Weiss
Acting Chairman ISWP-2
25 Mulberry Lane
Edison, New Jersey 08820-2908

Dear Merrill,

The attached is the Zenith/AT&T response to the additional Broadcast Questions (#8-10) asked in your 6/12/92 letter. We had hoped to respond earlier and we apologize for the delay.

Sincerely,

Ronald Lee

Ronald Lee

cc: Craig Tanner
Co-Chairman ISWP-2

BROADCAST

Question 8: Do you have information on the percentage of time peak powers of various levels above the average power occur with your system? If yes, please supply such information. A histogram showing the frequency of peaks of increasing power levels is the preferred form of presentation.

> **Answer:** Figure B-8.1 is a computer simulated histogram showing percentage of time the DSC-HDTV RF signal is below a particular value above the RMS. The dispersion used in the DSC-HDTV system, contributes 1-1.5 dB to the peak-to-average ratio. We intend to propose changes which will reduce the peak-to-average ratio. For your convenience, a new histogram which shows the effect of the change on the percentage of time the DSC-HDTV RF signal is below a particular value above the RMS is shown in Figure B-8.2 .

Question 9: Please supply information on what BER results from clipping the peaks of your signal at various levels above the average power of your system. Does the increase in BER directly correlate with the appearance of errors in the viewed picture? Is there some other measure than BER by which the effects of clipping should be evaluated? Please comment on the trade-offs resulting from the process of clipping peaks.

> **Answer:** BER is not the most critical function of clipping. Clipping levels that cause significant out-of-band radiation only affect the error threshold slightly. Table B9.1 shows the relationship between clipping and out-of-band radiation for the DSC-HDTV signal, at these clipping levels, the change in threshold is negligible.

clipping above RMS (dB)	% of time clipping	Out-of-Band Radiation at ATV band edge (dB)	Out-of-Band Radiation 6 MHz from ATV band Edge (dB)
7.92	0.01	-73.9	- 79.0
7.06	0.05	-58.7	- 63.9
6.65	0.1	-53.0	-58.7
5.53	0.5	-40.4	-48.3

Effects of Clipping DSC-HDTV Signal on Out-of-Band Radiation
TABLE B-9.1

Table B9.2 shows the effects of clipping on out-of-band radiation for the system with the intended change mentioned in question 8.

clipping above RMS (dB)	% of time clipping	Out-of-Band Radiation at ATV band edge (dB)	Out-of-Band Radiation 6 MHz from ATV band Edge (dB)
6.38	0.01	-77.8	-79.6
5.75	0.05	-63.5	-66.5
5.46	0.1	-57.8	-61.3
4.43	0.5	-43.9	-50.4

Effects of Clipping DSC-HDTV Signal (modified) on Out-of-Band Radiation
TABLE B-9.2

Question 10: Is your system capable of dealing with multiple signals carrying identical modulation arriving at the receiver, as would be the case with cellular operation or on-channel boosters? How close in frequency must the multiple signals be for the system to work properly? Is there any threshold in the difference in signal levels required to make the system work properly under such circumstances, and what is that threshold?

Answer: The DSC-HDTV system is designed to achieve 100% accommodation with the same coverage as existing NTSC service. Since we believe 100% accommodation is achievable without resorting to a cellular approach, we don't think a cellular approach is necessary.

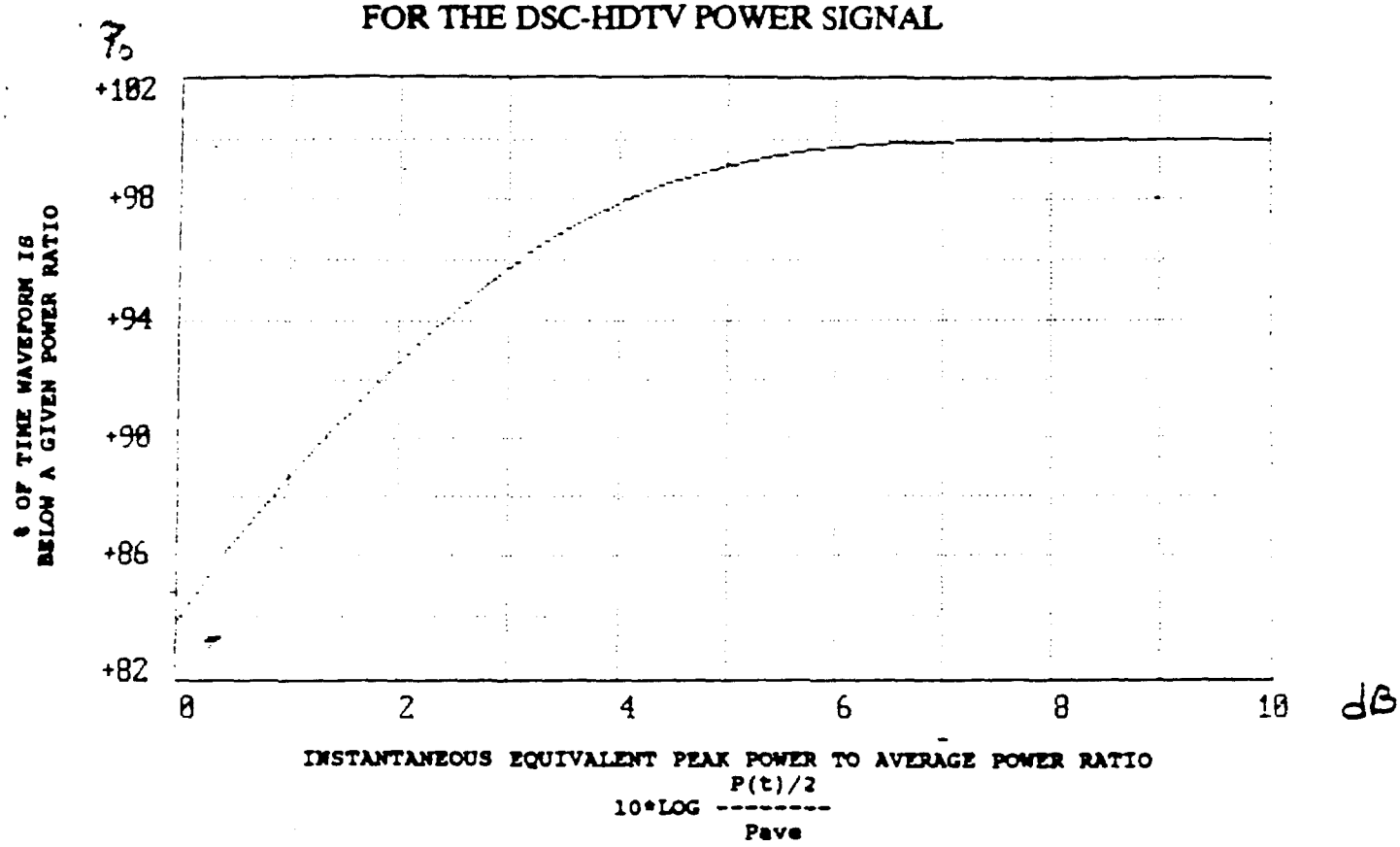
A cellular approach would be very costly to Broadcasters because of the extra transmitting equipment required and costly to consumers because of the additional adaptive equalizer burden to all consumers (not just those receiving a repeater signal) and the rotational antenna requirements. However, if cellular operation is desirable for some other reason, the DSC-HDTV system is capable of operating as described below.

The adaptive equalizer can handle multiple signals carrying identical modulation if their delay is within the range of the equalizer. However, there should be at least a +6 dB D/U, for each adjacent cell compared to the main cell, which could be achieved with a directional antenna. For best operation with the adaptive equalizer in the prototype hardware, the RF carriers should

be exactly frequency locked. However, with a different equalizer design, some tolerance of the carrier frequency on the order of 10 Hz could be acceptable.

FIGURE B-1

CUMULATIVE DISTRIBUTION FUNCTION
FOR THE DSC-HDTV POWER SIGNAL



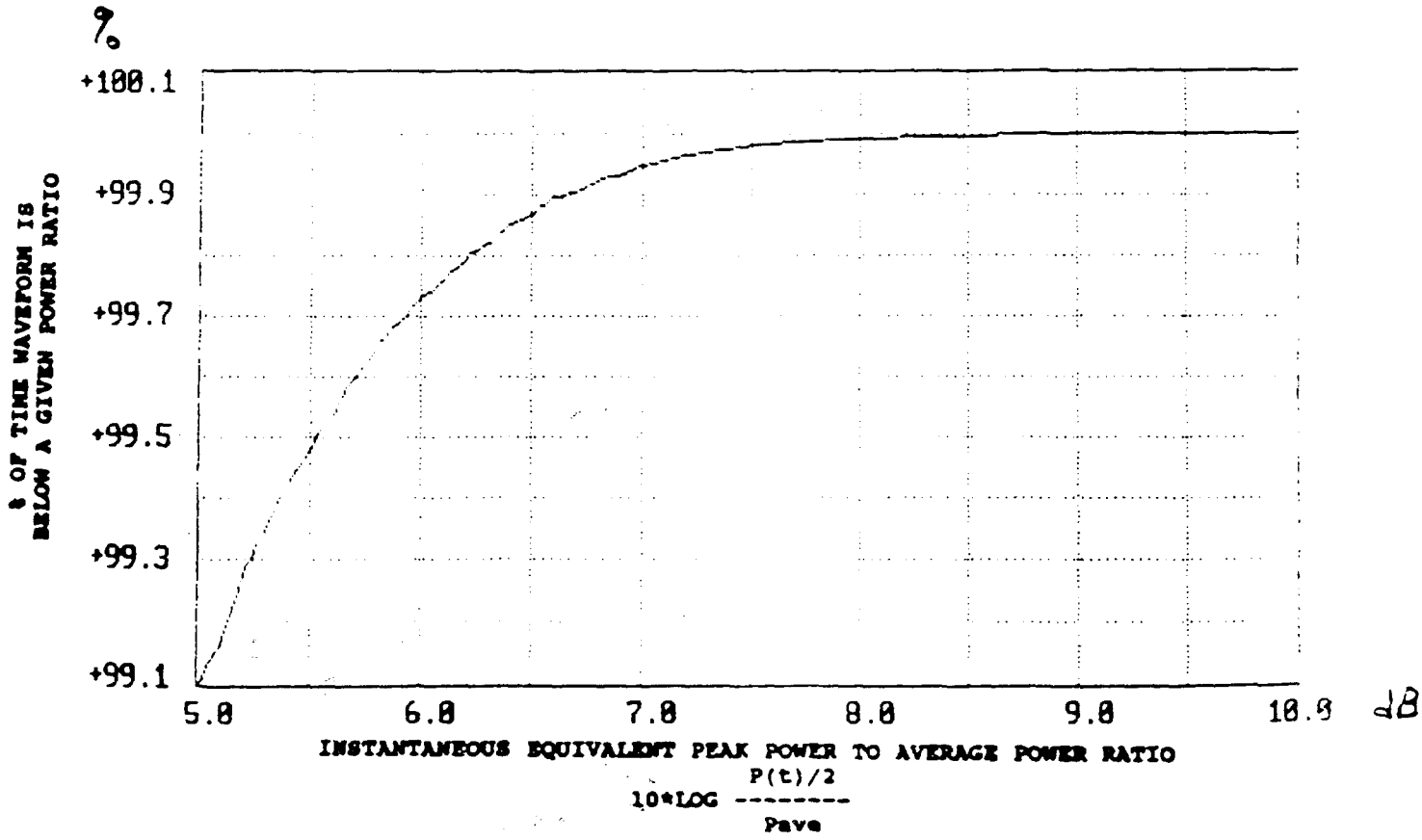
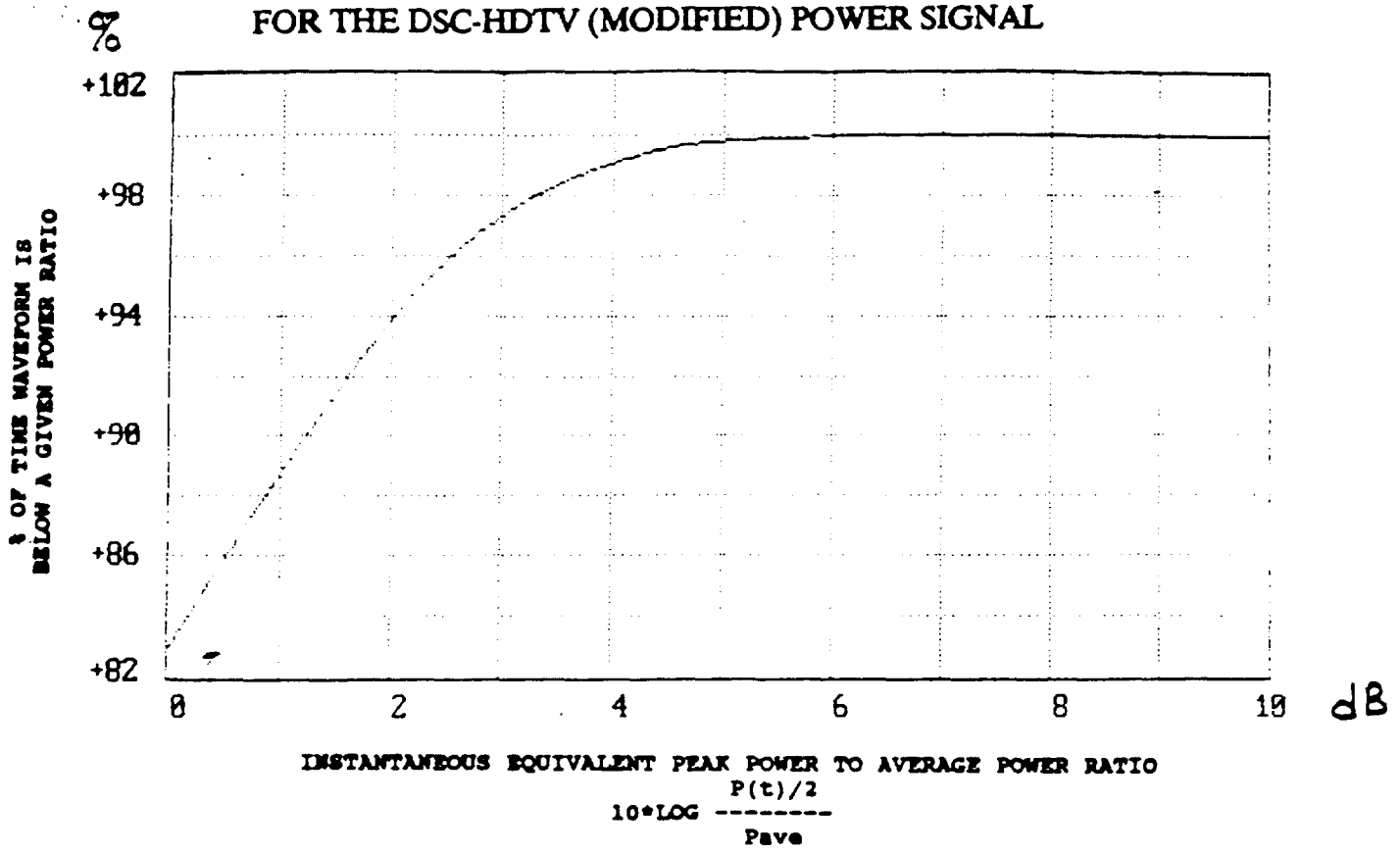
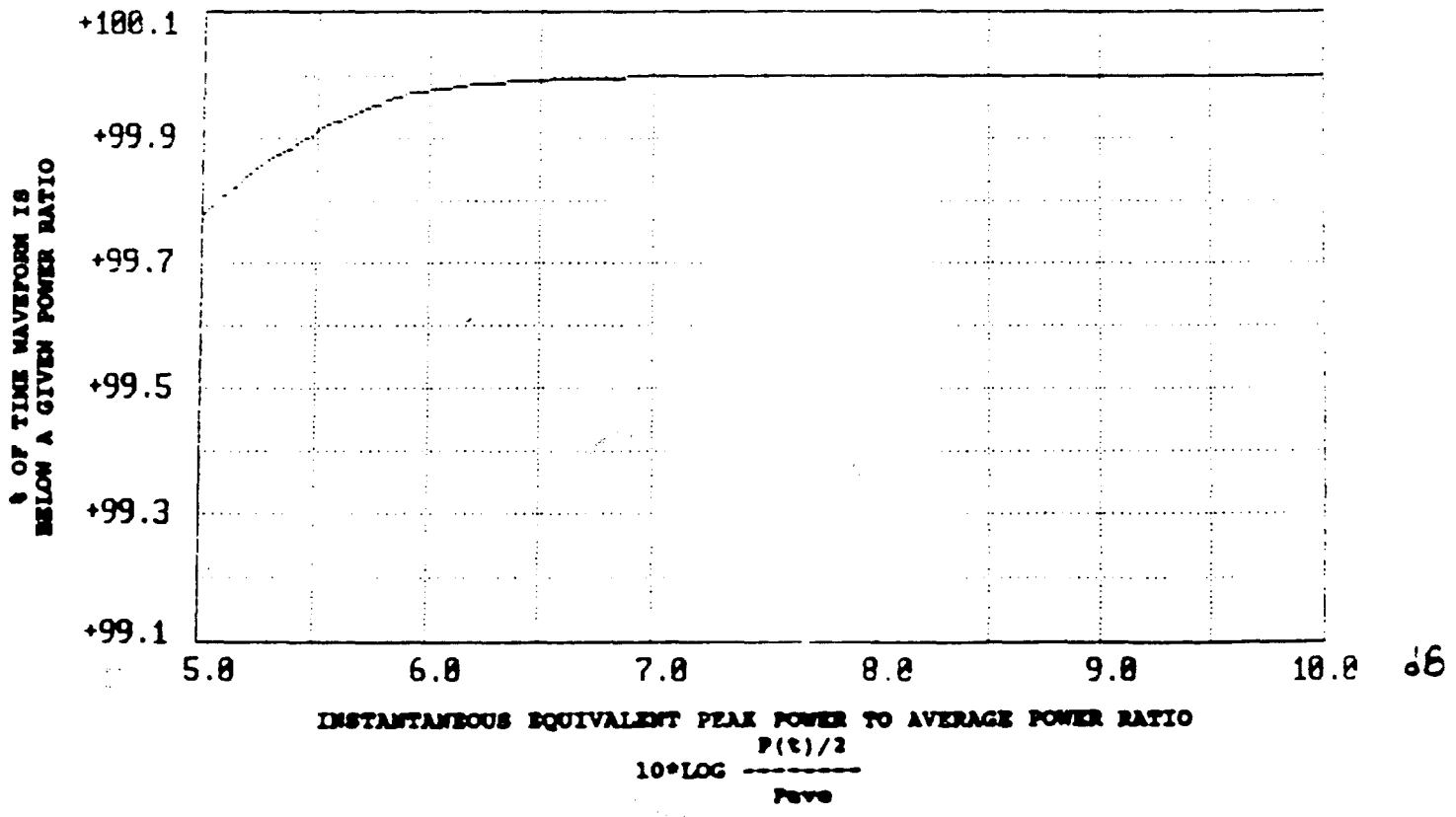


FIGURE [illegible]

CUMULATIVE DISTRIBUTION FUNCTION
FOR THE DSC-HDTV (MODIFIED) POWER SIGNAL





IS/WP2-0245
14 OCT 92

S. Merrill Weiss
25 Mulberry Lane
Edison, New Jersey 08820-2908

Glenn Reitmeier
Director
High Definition Imaging
and Computing Laboratory

Dear Merrill: October 13, 1992

Listed below is our revised response to IS/WP2 questions of 6/12/92.

8. The peak-to-average ratio of the AD-HDTV signal can be analytically estimated to be 10 dB. Recent experiments done with high power amplifiers indicate that operation with a 9 dB value is feasible. Independent measurements made by the ATTC as part of the test plan are expected to be released in the near future.

9. We have measured the effect of clipping on the peak-to-average ratio of a single QAM signal. These tests show that a 0.5 dB reduction of the peak-to-average ratio produces a bit error rate of 10^{-6}, and that a 1.0 dB reduction produces a bit-error rate of 4.0×10^{-4}. These clipping levels will not produce errors in the viewed picture, but for fringe area reception with noise and interference will increase the S/N for the threshold of visibility. The trade off between increased power capability allowed by clipping and the effects of clipping on signal reception requires additional study.

10. The AD-HDTV system is capable of working with multiple signals as required for cellular operation and on-channel boosters. Measurements made with our present equalizer for two signals show that a difference in amplitude of 5 dB or more is required for a delay difference up to 0.85 microseconds, 7 dB or more for delay differences up to 1.7 microseconds, and 10 dB or more for delay differences up to 3.4 microseconds.

These stated delay values will be doubled for field testing by inclusion of an improved equalizer in the AD-HDTV receiver. The above results apply to zero or very small carrier frequency differences between the two signals. The feasibility and desirability of locking carrier frequencies of multiple transmitters should be considered if such an operational mode is proposed.

Regards,

Glenn /jtm

Glenn A. Reitmeier

/jtm

cc: L. Thorpe

IS/WP2-0246
14 OCT 92

PHILIPS

Philips Laboratories - Briarcliff

October 13, 1992

S. Merrill Weiss
25 Mulberry Lane
Edison, NJ 08820-2908

Dear Merrill:

This letter is in further response to the IS/WP2 draft Summary of Responses to questions which was addressed in Glenn Reitmeier's letter to you on August 19, 1992 that provided an "ATRC Reply to IS/WP2 Summary of Responses". Within that reply, on the subject of broadcast power levels, ATRC stated its belief that PS/WP3 should, for each proponent system, based on ATTC test results determine the average and peak transmitter power values which will provide an ATV service area equal to NTSC. ATRC now realizes, based on recent information, that this desired ATTC test data will not be available within the IS/WP2 and SS/WP3 committees' designated time frames for preparation of their final reports. ATRC is therefore providing to the committees for their consideration the results of its Systems Comparison of Coverage v. Average Power. The salient item from this study is that, when equal receiver factors are used for all systems, the transmitter average power spread is only 0.8dB. This is also seen to be a direct result of the proponents' stated receiver C/N threshold.

Although ATTC test data for the ATRC AD-HDTV system is not yet available, our own laboratory results indicate that a peak-to-average power ratio of 9dB can be measured in the AD-HDTV signal. In addition, some preliminary results of the recent ATRC field test effort have been made public. Attached is a September 30, 1992 News Release from Comark Communications, Inc. addressing the ATRC's selection of a Comark 50 kW IOT equipped UHF transmitter to broadcast AD-HDTV on channel 38 from the WRC-TV tower in Washington, D.C. Some indication of real-world peak-to-average power ratios is contained in paragraph 3, "... During the tests, average power levels as high as 10 kW were obtained, also at a zero Bit Error Rate." If one expects that a transmitter rated at 50 kW should be capable of +10% (55 kW), the operating peak-to-average power ratio (55 kW/10 kW) used while the ATRC AD-HDTV system was delivering a zero BER, is believed to be about 7.4 dB. These results appear to indicate that some additional realistic amount of peak-to-average power compression can be achieved in practice.

Paragraph six of the Comark News Release addresses economic factors. "The estimated cost of the entire facility, less tower and building is under $500,000."

Philips Laboratories
North American Philips Corporation

345 Scarborough Road
Briarcliff Manor, New York 10510

Telephone: (914) 945-6000
Facsimile: (914) 945-6375
Telex: 646326 philab bfrl

ATRC believes this to be a significant factor in the future implementation of Advanced Television.

We trust that the enclosed materials can be helpful to the committees' in their efforts to perform their tasks.

Sincerely,

Kenneth R. Skinner

Copy:
Larry Thorpe, C. SS/WP3

COMARK
A THOMSON-CSF COMPANY

NEWS RELEASE

COMARK DUAL USE™ 50 KW UHF TRANSMITTER DEMONSTRATES SIMULCAST AD-HDTV AT WRC-TV IN WASHINGTON, D.C.

Colmar, PA.....September 30, 1992

The Advanced Television Research Consortium (ATRC) chose a Comark 50 kW IOT equipped, DUAL USE™, UHF transmitter to broadcast AD-HDTV over the Washington, D.C. market on September 30, 1992. The demonstration is the first full power broadcast of HDTV using the ATRC system and will continue on a scheduled basis for up to ten days.

The Comark transmitter is installed at the NBC owned VHF station, WRC-TV. The installation was planned solely for the HDTV test and demonstration and included an Alan Dick antenna and Andrew transmission line. The Alan Dick antenna is side-mounted on the existing WRC tower at the 290 ft. elevation. The broadcasts are taking place on Channel 38.

The 50 kW Comark transmitter is designed for DUAL USE™ operation. In NTSC mode, the transmitter provides a high quality 50 kW peak sync signal using common amplification technology. In the AD-HDTV demonstration broadcast, the transmitter provides 5 kW average output which represents about 50 kW peak with zero Bit Error Rate. During the tests, average power levels as high as 10 kW were obtained, also at a zero Bit Error Rate.

The ability of the Comark transmitter to be switched between NTSC and AD-HDTV, without any adjustment, permits precise comparative measurements to be recorded showing AD-HDTV and NTSC received over the same propagation path.

As a result of the location of the AD-HDTV transmitter at WRC, a VHF station, the WRC-TV tests are the first time HDTV has been simulcast with NTSC for public or private tests or demonstrations.

The standard Comark DUAL USE™ transmitter and its associated antenna and transmission line, were installed at WRC-TV within a ten day period. The estimated cost of the entire facility, less tower and building is under $500,000. Thus, a full power HDTV transmitting facility has been demonstrated where cost is clearly established.

Comark Communications, Inc. is a subsidiary of Thomson-CSF. Comark maintains its headquarters in Colmar, PA and its manufacturing facility in Southwick, MA.

For further information, contact Ellen Rainey, Corporate Communications Manager, at 215-822-0777.

• •

transmitter power differences required to provide equal coverage radii are directly proportional db for db to differences in system receiver C/Ns.

Since IS/WP2's request for transmission power levels (ERP) required for the system's coverage equal to NTSC included both low and high VHF, ATRC is providing the results of VHF comparisons similar to those shown above for UHF. ATRC assumed, for low VHF, a television station operating in Zone I at maximum allowed facilities (20 dBK, AHAAT = 299meters). Based on FCC F(50,50) low VHF curves the Grade B service radius is 64.3 miles (signal strength = 47 dBu/m). ATRC assumed some typical receiver factors for the low VHF band and added this TRF to each system's given C/N to obtain required system signal strengths at 64.3 miles. ATRC then calculated the required ERP for each system to place its NLC at a distance 64.3 miles (NTSC low VHF Grade B in Zone I). These results, shown in Table 4, again reveal a power spread among systems of 0.8 db, again the same as the systems C/N spread.

For high VHF, we assumed a television station operating in Zone 1 at maximum facilities (25 dBK, AHAAT = 299 meters). Based on FCC F(50,50) curves for high VHF the Grade B service radius is 59.2 miles (signal strength = 56 dBu/m). ATRC assumed some typical receiver factors for that band and added that TRF to each system's C/N to again obtain required signal strengths at 59.2 miles. The ERP required to place each system's NLC at 59.2 miles was calculated and shown in Table 5. The system ERP spread is again 0.8 db, equal to the system C/N spread.

The above results differ substantially with some of the average power figures shown in the table on page 11 of IS/WP-2-0225/Rev. 2.2. For example:

	Average Power IS/WP-2			Average Power with same factors		
	Lo V	Hi V	UHF	Lo V	Hi V	UHF
DigiCipher	-18db	-18db	-13db	-11.5db	-12.9db	-11.5db
DSC-HDTV	-15db	-15db	-12db	-12db	-13.4db	-12db
AD-HDTV	-12db	-15db	-11db	-11.9db	-13.3db	-12db
CC-DigiCipher	-18db	-18db	-13db	-12.3db	-13.7db	-12.3db

All Reference: NTSC Peak Power

Channel 6 = 20 dBk = 100 kW
Channel 13= 25 dBk = 316 kW
Channel 36= 37 dBk = 5000 kW

Noting that the revised average power figures are based on equal receiver factors within each band for all systems, it is revealed that differences among systems in power required for equal coverage depends directly on differences in receiver C/N.

TABLE 1

PUBLISHED CHARACTERISTICS

	DigiCipher	AD-HDTV	CC-DigiCipher	DSC-HDTV
Average ERP (dBk)	22.5	25.4	23.9	22.5
AHAAT (feet)	1200	1200	1200	1250
NLC (miles)	52	54.5	53.1	53.0
Signal Strength (dbu/m)	52.2	53.3	52.8	52.0
C/N (db)	16.5	16.1	15.7	16.0
Total Receiver Factor (db)	35.7	37.2	37.1	36.0

(TYPICAL UHF RECEIVER FACTORS INCLUDE:)

Thermal noise (in 6 MHz)	2.6 db
Tuner noise figure (NF)	10 db
Antenna gain (dbd)	-10 db
Dipole factor (at UHF Ch. 36)	22 db
Downlead loss	4 db
Conversion factor [F(50,50)/F(50,90)]	8.7 db
Total (TRF)	37.3 db

SYSTEMS COMPARISON
COVERAGE V. AVERAGE POWER
Page 4

TABLE 2

EFFECTIVE RADIATED POWER REQUIRED
to Provide stated C/N at 55 Miles

Using Proponent's Receiver Factors (TRF)
All transmitting antennas (AHAAT) are equalized to 1200 feet.

	DigiCipher	AD-HDTV	CC-DigiCipher	DSC-HDTV
Signal Strength (dbu/m) required at 55 miles	52.2	53.3	52.8	52.0
Necessary Average ERP (dBK)	24.7	25.8	25.3	24.5

TABLE 3

EFFECTIVE RADIATED POWER REQUIRED
to Provide stated C/N at 55 Miles

Using Equal Receiver Factors. Average of four proponent factors = 36.5 db

	DigiCipher	AD-HDTV	CC-DigiCipher	DSC-HDTV
C/N (db)	16.5	16.1	15.7	16.0
Average Rec. Factor	36.5	36.5	36.5	36.5
Signal Strength (dbu/m) required at 55 miles	53.0	52.6	52.2	52.5
Necessary Average ERP (dBK)	25.5	25.1	24.7	25.0

TABLE 4

COVERAGE COMPARISON
Low VHF Band

Assumed transmission facility: Channel 6, Zone I, maximum power = 20 dBK, maximum AHAAT = 299 meters, Grade B contour signal strength = 47 dBu/m, and F(50,50) distance to Grade B contour = 64.3 miles.

	DigiCipher	AD-HDTV	CC-DigiCipher	DSC-HDTV
C/N (db)	16.5	16.1	15.7	16.0
*Receiver Factors (db)	19	19	19	19
Signal Strength (dBu/m)	35.5	35.1	34.7	35.0
Required Average ERP (dBK) to place NLC at 64.3 miles.	8.5	8.1	7.7	8.0

*Assumed receiver factors:

(TYPICAL Low VHF RECEIVER FACTORS INCLUDE:)

Thermal noise (in 6 MHz)	2.6 db
Tuner noise figure (NF)	6 db
Antenna gain (dbd)	-4 db
Dipole factor (at VHF Ch. 6)	4.7 db
Downlead loss	1 db
Conversion factor {F(50,50)/F(50,90)}	8.7 db
Total (TRF)	19 db

TABLE 5

COVERAGE COMPARISON
High VHF Band

Assumed transmission facility: Channel 13, Zone I, maximum power = 25 dBK, maximum AHAAT = 299 meters, Grade B contour signal strength = 56 dBu/m, and F(50,50) distance to Grade B contour = 59.2 miles.

	DigiCipher	AD-HDTV	CC-DigiCipher	DSC-HDTV
C/N (db)	16.5	16.1	15.7	16.0
*Receiver Factors (db)	26.6	26.6	26.6	26.6
Signal Strength (dBu/m)	43.1	42.7	42.3	42.6
Required Average ERP (dBK) to place NLC at 59.2 miles.	12.1	11.7	11.3	11.6

*Assumed receiver factors:

(TYPICAL High VHF RECEIVER FACTORS INCLUDE:)

Thermal noise (in 6 MHz)	2.6 db
Tuner noise figure (NF)	7 db
Antenna gain (dbd)	-6 db
Dipole factor (at VHF Ch. 13)	12.8 db
Downlead loss	1.5 db
Conversion factor [F(50,50)/F(50,90)]	8.7 db
Total (TRF)	26.6 db

JEFFREY A. KRAUSS, PH.D.
TELECOMMUNICATIONS AND TECHNOLOGY POLICY
17 WEST JEFFERSON STREET
SUITE 106
ROCKVILLE, MD 20850

TEL: 301-309-3703
FAX: 301-309-9323

FAX

Total number of pages including this page = 4

DATE: September 15, 1992

THIS FAX IS TO:

NAME: Merrill Weiss

COMPANY:

TELEPHONE:

FAX:

FROM: Jeffrey Krauss

SUBJECT: DigiCipher Peak-to-Average Measurements