EXHIBIT D

Ex Parte Letter from Pantelis Michalopoulos,

Counsel for EchoStar Satellite L.L.C. to

Marlene H. Dortch, Secretary, FCC,

filed in ET Docket No. 05-182 (Aug. 25, 2005)

STEPTOE & JOHNSON LLP
ATTORNEYS AT LAW

Pantelis Michalopoulos
202.429.6494
pmichalo@steptoe.com

1330 Connecticut Avenue, NW
Washington, DC 20036-1795
Tel 202.429.3000
Fax 202.429.3902
steptoe.com

August 25, 2005

VIA ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: **Ex Parte Written Presentation**
In the Matter of Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Extension and Reauthorization Act of 2004 -- ET Docket No. 05-182

Dear Ms. Dortch,

In accordance with Section 1.1206 of the Commission's Rules, 47 C.F.R. § 1.1206, EchoStar Satellite L.L.C. ("EchoStar") hereby submits (a) the results of a survey commissioned by EchoStar regarding the antenna equipment and quality expectations of consumers that rely on over-the-air reception; and (b) a further statement of Hammett & Edison, Inc. ("H&E Further Statement") providing additional signal strength data on time variability and responding to certain arguments raised by broadcasters.

In short, the survey shows that the percentage of consumers with sophisticated rotatable antennas is about 26% in remote areas, and about 20% overall. Moreover, a very large portion of consumers, 43% in remote areas, do not even have an outdoor antenna. Overall, the *majority* of consumers do not have an outdoor antenna of any kind. These realities strongly militate for a change to the Commission's signal strength testing procedures. The current procedure effectively assumes that that consumer is equipped with an outdoor antenna that can be rotated. Under the current rules, the test antenna must be mounted outdoors and oriented in the direction of greatest signal strength for the local network station in question. Similarly, the Individual Location Longley-Rice ("ILLR") model assumes that consumers have an antenna with a directional gain pattern oriented in the direction of the

transmitter. Therefore, in developing measurement rules and recommending to Congress use of a predictive model, the Commission should *not* assume that the typical consumer has an outdoor antenna, much less that he or she has a rotatable antenna. Such assumptions would be the opposite of the reality on the ground. In addition to the options suggested in EchoStar's comments for reflecting these realities, EchoStar is hereby submitting an alternative field testing procedure for the Commission's consideration. Under this alternative, the tester measures the signal strength of each local network station at each of a number of antenna orientations. These orientations are determined by rotating the test antenna to the direction of maximum signal strength for *every* network station in the market (including the station being measured). The tester then simply calculates the median of the resulting measurements (as is done already for each of the five so-called "cluster measurement" points).

The survey also shows that the majority of consumers expect DTV reception to be more reliable than analog reception. These heightened expectations mean that the Commission should consider revising upward the threshold DTV strength standard which decides whether a household is served in the first place.

Finally, the broadcasters ask that the Commission should discount the importance of inadequate signal strength during the day on the ground that signals are typically stronger during the primetime hours. That request reflects a rather cavalier disregard for localism -- in particular, for the ability of consumers to receive local programming often broadcast prior to primetime. In any event, however, the claim of a typical differential between day and night relies on an erroneous and highly selective reading of an FCC study. For VHF broadcasts, for example, the study cited by the broadcasters found the differential on which they rely to be "negligible."

I. SURVEY

For the purposes of this proceeding, EchoStar commissioned The Survey Center of Maspee, Massachusetts, to conduct a consumer telephone survey. The survey's objective was to determine what kind of over-the-air antennas consumers employ and to ascertain consumer expectations concerning the quality of DTV reception. During the period June 20 to July 5, 2005, the Survey Center asked a set of questions to randomly selected persons residing in four categories of areas, as classified by Nielsen Media Research ("Nielsen") based on population density.[1] To ensure adequate statistical

[1] Nielsen classifies counties into four groups -- "A," "B," "C," and "D" -- based on Census household counts and metropolitan proximity. "A" counties are highly urbanized areas and belong to the 21 largest Metropolitan Statistical Areas. These counties combined contain 40% of U.S. households. "B" counties are non-A counties that have more than 85,000 households. When combined, "B" counties contain 30% of U.S. households. "C" counties are non-A and non-B counties that have more than 20,000 households or are in Consolidated Metropolitan Statistical Areas or Metropolitan Statistical Areas with more than 20,000 households. The combined "C" counties contain 15% of U.S. households. "D" counties comprise all other counties and are considered very rural. 15% of U.S. households are in "D" counties. *See* http://www.nielsenmedia.com/glossary (last visited Aug. 5, 2005).

significance, the Survey Center continued to survey respondents until it had responses from 225 people in each of the four classes of county indicating that they watched television programming on a television in their home that relies exclusively on an antenna for reception. The survey questions and results are tabulated in Exhibit 1.

The results of the survey are that most consumers who rely on over-the-air reception have indoor antennas, and only a small minority of consumers have sophisticated "rotatable" outdoor antennas. This is the case even in rural "C" and "D" counties, where consumers would be expected to have comparatively more sophisticated television reception equipment. Only about 26% of the consumers who rely on over-the-air reception had outdoor rotatable antennas, while 43% had indoor antennas on or near their televisions. For all respondents that relied on over-the-air reception (from "A" through "D" counties), the percentages of households with outdoor rotatable antennas were even lower at about 20%, and conversely the percentages of households with indoor antennas was even higher at 51%.[2] In such circumstances, it would be unwise to assume that consumers have outdoor antennas that can be oriented in the direction of maximum signal strength either for purposes of measuring or predicting signal strength.[3]

These survey results show that retention of the current digital signal strength testing procedures and ILLR model, with their unrealistic assumptions about consumer antenna types, placement and pointing, will inevitably lead to many inaccurate determinations as to when a consumer can actually receive a good quality DTV picture over-the-air. This problem is made worse by the survey's results showing consumers' heightened expectations regarding DTV reception. More than half (57%) of all survey respondents who rely on over-the-air reception said that they expected the reliability of their local broadcaster's over-the-air digital signal to be much better or somewhat better than the reliability of the station's analog signal.[4] A similar percentage responded that the availability of digital satellite or cable service raised their expectations about the quality and reliability of television reception.

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[2] The results are even more stark if the survey results for respondents from each class of county are weighted by each class's share of U.S. households (40% for "A" counties, 30% for "B" counties, and 15% each for "C" and "D" counties). The resulting nationwide percentages are as follows: 18% of households that rely on over-the-air reception have outdoor rotatable antennas, and 54% have indoor antennas.

[3] *See* 47 C.F.R. § 78.686(d)(2)(iv); Federal Communications Commission, OET Bulletin No. 72, *The ILLR Computer Program*, at 3 (July 2, 2002) ("OET Bulletin No. 72"), *referring to* OET Bulletin No. 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference* (Feb. 6, 2004) ("OET Bulletin No. 69").

[4] If the survey results for respondents from each class of county are weighted by their share of U.S. households (40% for "A" counties, 30% for "B" counties, and 15% each for "C" and "D" counties), the resulting nationwide percentage of households that have higher DTV reception expectations is 56%.

Therefore, the Commission should discard the unrealistic assumptions in its testing methodology and predictive model to avoid defeating the DTV reception expectations of a majority of U.S. households.

Accordingly, the Commission should revise its testing procedures and predictive model to make them more realistic. EchoStar has already put forward several changes in its comments that would greatly improve the accuracy of the signal strength testing procedures and predictive model.[5] EchoStar is hereby submitting an additional alternative that could accomplish that result for field strength testing. Under the current rules, the tester would take the median of five cluster measurements with the antenna pointing in the direction of greatest signal strength for the local network station in question.[6] EchoStar's proposed alternative is for the tester to repeat the cluster measurements for a particular signal with the antenna oriented in several different positions. Each position is determined by orienting the antenna so as to receive a maximum strength signal from each of the local network stations (including the station to be measured). The tester then derives the median of these measurements. This method would take into account antenna mis-orientation in light of the fact that most consumers do not have rotatable antennas.. As H&E describes the method:[7]

> While the optimal orientation cannot be known *a priori* for a particular location, a more reasonable way to account for antenna mis-orientation would be as follows, when several stations are being measured to determine DTV field strength.
>
> 1. Orient the measurement antenna in the direction which maximizes the value of field strength for the first station to be measured, and record the field strength for that station, as described in Section 73.686(d)(2)(iv).
>
> 2. While maintaining this antenna orientation, record the field strength for the other stations to be measured.
>
> 3. Repeat steps 1 and 2 in turn for each of the other stations to be measured.
>
> This procedure is compatible with the present rule, which specifies a cluster measurement of five points in the area of the subscriber's antenna. When measuring four network stations, for instance, the above procedure will result in 20 measurements for each station: one for each antenna orientation at each of the five cluster measurement points.

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[5] *See* Comments of EchoStar Satellite L.L.C., *filed in* ET Docket No. 05-182 (filed June 17, 2005); Reply Comments of EchoStar Satellite L.L.C., *filed in* ET Docket No. 05-182 (filed July 5, 2005).

[6] *See* 47 C.F.R. § 73.686(d)(1)(ii).

[7] *See* H&E Further Statement at 5.

From those data, one can calculate the median of the 20 measurements in units of dBu, and use that as the measurement result.

II. H&E FURTHER STATEMENT

The H&E Further Statement (attached as Exhibit 2) addresses two issues raised in the reply comments of certain broadcaster interests related to time variability of signal strength.

First of all, a number of broadcast parties criticized EchoStar for not submitting all of the signal strength data that had been collected to support H&E's report on the issue of time variability.[8] The H&E Further Statement addresses this by providing the remainder of the signal strength data collected in support of H&E's June 17 statement.[9] The Further Statement also describes the method used to collect the signal strength data and some of H&E's most striking findings.[10] These additional data fully support the need to adjust both the testing procedures and any DTV predictive model to address variability in digital signal strength over time. With respect to the testing procedures, the proper adjustment is to conduct cluster measurements to determine the median signal strength value and then apply a correction factor to achieve 90% time reliability. With respect to the ILLR model, the time variability factor inherent in the predictive model is 50%.[11] Accordingly, the DTV signal strength standards in 47 C.F.R. § 73.622(e)(1) need to be adjusted, as H&E suggests, to provide for 99% time reliability as a matter of prudence until there is greater experience with consumer reception of DTV signals, and certainly to no less than the 90% reliability assumed in the DTV planning factors. Indeed, the Commission found it necessary to make a similar adjustment in the analog context when it established the Grade B contour.[12] The DTV signal strength standards, however, did not incorporate a

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[8] *See* Reply Comments of the ABC, CBS, and NBC Television Affiliate Associations at 7, *filed in* ET Docket No. 05-182 (filed July 5, 2005); Reply Engineering Statement of Meintel, Sprignoli & Wallace Concerning Measurement and Prediction of Digital Television Reception at ¶ 21, *filed in* ET Docket No. 05-182 (filed July 5, 2005) ("MSW Reply Statement").

[9] *See* H&E Further Statement at 1-3, figs. 1 and 2.

[10] *Id.* at 1-2.

[11] OET Bulletin No. 72, at 3.

[12] *See* OET Bulletin No. 72, at 3 (2002) (using 50% time variability in the ILLR on the basis that the Grade B field strength "already includes an allowance for long term (daily and seasonal) time fading"); *In the Matter of Technical Standards for Determining Eligibility For Satellite-Delivered Network Signals Pursuant To the Satellite Home Viewer Improvement Act*, FCC 00-90, Report, 15 FCC Rcd 24321, at ¶ 6 n.20 (2000) ("This adjustment results in a Grade B value that predicts reception of an acceptable picture 90% of the time. For example, on channels 2-6, a signal strength of 41 dB/ [mu] v/m is needed for an acceptable picture. In order for this signal strength to be available 90% of the time, the

(Continued...)

correction for time variability, as is evident in the procedure prescribed in 47 C.F.R. § 73.625(b) for deriving the F(50,90) DTV field strength contour using the F(50,50) and F(50, 10) charts.[13] The Commission should do no less in the DTV context than it has done in the analog context to ensure adequate signal strength reliability over time.

The engineering consultants engaged by the National Association of Broadcasters ("NAB") challenge EchoStar's proposed method of correcting for time variability by claiming that it is improper to assume that signal strength measured during the day represents the median over time.[14] The NAB's consultants rely on FCC Report No. R-6602 for the proposition that "field strength measurements, which are taken during the daytime, will typically be lower than at night (*e.g.*, "primetime") when the majority of television viewing occurs. . . . Thus, signal strength measurements during the daytime are likely to be below the median over time."[15] By asking the Commission to discount the importance of inadequate signal strength during the day on the ground that signals are typically stronger during the primetime evening hours, the broadcasters are showing a cavalier disregard for localism -- in particular, for the ability of consumers to receive the local programming often broadcast prior to primetime. In any event, as the H&E Further Statement shows, the claim of a typical differential between day and night relies on an erroneous and highly selective reading of a FCC report cited by the broadcasters. First, NAB's consultants fail to mention that the same report found that "the differential between the day and night field strengths was negligible in the VHF bands . . . ."[16] Moreover, reliance on the report as support for diurnal variation in UHF signal strength is fundamentally flawed because the report was in support of an "area-method propagation" model that has since been superseded by point-to-point propagation models such as the ILLR. In fact, H&E's analysis of field

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median or F(50,50) field strength is set at 47 dB/ [mu] v/m, which includes the addition of a time variability planning factor of 6 dB.").

[13] *See also* OET Bulletin No. 69, at 2 (2005) ("For digital television stations, service is evaluated inside contours determined by DTV planning factors in combination with field strength curves derived for 50% of locations and 90% of the time from curves which are also found in Section 73.699 of FCC rules. The family of FCC propagation curves for predicting field strength at 50% of locations 90% of the time is found by the formula F(50, 90) = F(50, 50) - [F(50, 10) - F(50, 50)]. That is, the F(50, 90) value is lower than F(50, 50) by the same amount that F(50, 10) exceeds F(50, 50).").

[14] MSW Reply Statement at ¶ 23.

[15] *Id.*

[16] Jack Damelin et al., *Development of VHF and UHF Propagation Curves for TV and FM Broadcasting*, FCC Report No. R-6602, at 6 (1974).

measurements it collected over a two-week period shows that the typical variation over a 24-hour period is less than ±1 dB and, more importantly, was not systematic as between day and night.[17]

III. CONCLUSION

Both the survey results and the H&E Further Statement underscore the need to change the Commission's signal strength testing standards and procedure, and the existing ILLR predictive model, to determine more accurately when a consumer can actually receive a good quality DTV picture over-the-air. In particular, the Commission should revise its signal strength testing standards and procedures (and any DTV predictive model) by discarding the unrealistic assumptions inherent in them regarding consumer antennas and antenna placement. Moreover, it should correct for time variability in signal strength over time to ensure consumers can receive a reliable DTV signal. The Commission risks defeating the heightened expectations of consumers if it were to fail to take these matters into account.

If you have any questions regarding this matter, please do not hesitate to contact the undersigned.

Respectfully submitted,

/s/

Pantelis Michalopoulos
Counsel for EchoStar Satellite L.L.C.

cc:

David Sturdivant, Office of Engineering & Technology

[17] H&E Further Statement at 4.

EchoStar Satellite L.L.C.
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EXHIBIT 1

Table 1-1

1. Do you have a television or televisions in you home?

	Overall
Yes	4,726 98%
No	75 2%
Totals	4,801

Table 2 –1

2. Do you watch TV programming on a television in your home that relies exclusively on an antenna for reception? **This could be your main TV or a second or third TV on which you don't have cable or satellite.**

Base: Those who have a television or televisions in their homes.

	Overall
Yes	900 19%
No	3,826 81%
Totals	4,726

Table 3-1

3. Is the antenna for this television mounted on the roof or attic of your home or apartment, or is it on or near the television itself

Base: Those who watch TV programming on a television in their homes that relies exclusively on an antenna for reception.

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
On roof or in attic	439 49%	104 46%	79 35%	112 50%	144 64%
On or near TV	461 51%	121 54%	146 65%	113 50%	81 36%
Totals	900	225	225	225	225

Table 4-1

4. Can you rotate this antenna remotely? *(If they say they have a rotor on their antenna = Yes)*

Base: Those whose antenna is mounted on the roof or attic of their home or apartment.

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
Yes	181 41%	34 33%	31 39%	56 50%	60 42%
No	258 59%	70 67%	48 61%	56 50%	84 58%
Totals	439	104	79	112	144

Table 5-1

5. On which story of your residence is this television located?

Base: Those whose antenna is on or near the television itself.

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
First	328 71%	75 62%	105 72%	83 73%	65 80%
Second	115 25%	42 35%	35 24%	24 21%	14 17%
Third or higher	18 4%	4 3%	6 4%	6 5%	2 2%
Totals	461	121	146	113	81

Table 6-1

6. Do you also subscribe to a pay television provider such as cable or satellite?

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
Yes	431 48%	109 48%	94 42%	114 51%	114 51%
No	469 52%	116 52%	131 58%	111 49%	111 49%
Totals	900	225	225	225	225

Table 7-1

7. How would you expect the reliability of receiving your local broadcaster's *digital* signal over the air to compare with the reliability of receiving its *analog* signal today?

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
Much better (5)	200 22%	46 20%	50 22%	52 23%	52 23%
Somewhat better (4)	319 35%	72 32%	82 36%	84 37%	81 36%
The same (3)	333 37%	97 43%	79 35%	82 36%	75 33%
Somewhat worse (2)	36 4%	8 4%	11 5%	5 2%	12 5%
Much worse (1)	12 1%	2 1%	3 1%	2 1%	5 2%
Totals	900	225	225	225	225
Mean	3.73	3.68	3.73	3.80	3.72

Table 8-1

8. Has the availability of digital satellite TV service, such as DirecTV and DISH Network and digital cable service raised your expectations about the quality and reliability of television reception?

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
Yes	510 57%	116 52%	128 57%	136 60%	130 58%
No	390 43%	109 48%	97 43%	89 40%	95 42%
Totals	900	225	225	225	225

Table 9-1

9. Which of the following statements best describes your current residence?

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
Own or rent single unit	769 85%	167 74%	195 87%	193 86%	214 95%
Own or rent in multiple dwelling unit	131 15%	58 26%	30 13%	32 14%	11 5%
Totals	900	225	225	225	225

Table 10-1

10. Are there any outdoor areas of your current residence that only you and the persons you permit may use? These "exclusive outdoor areas" may include a balcony, terrace, deck or patio that others in your building may not use without your permission. These areas would *not* include any *common* areas which are shared with others or accessible without your permission.

Base: Those who rent a single dwelling unit or own or rent a unit in a multiple dwelling building.

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
Yes	90	40	22	25	3
	69%	69%	73%	78%	27%
No	41	18	8	7	8
	31%	31%	27%	22%	73%
Totals	131	58	30	32	11

Table 11-1

11. How many total stories are there at your residence?

	Overall	Population density area A	Population density area B	Population density area C	Population density area D
One	439 49%	93 41%	113 50%	104 46%	129 57%
Two	312 35%	83 37%	77 34%	80 36%	72 32%
Three or more	149 17%	49 22%	35 16%	41 18%	24 11%
Totals	900	225	225	225	225

CERTIFICATION OF JAY AMBROSE

I, Jay Ambrose, certify under penalty of perjury that the foregoing discussion of the survey methodology and results is true and correct.

Executed on: August 25, 2005

Jay Ambrose, President
The Survey Center
800 Falmouth Road, Unit 304C
P. O. Box 1168
Mashpee, MA 02649

EchoStar Satellite L.L.C.
Notice of *Ex Parte* Presentation
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EXHIBIT 2

Further Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by EchoStar Satellite L.L.C. to prepare a further engineering statement in support of its *ex parte* filing to the FCC's Notice of Inquiry in ET Docket No. 05-182, "Technical Standards for Satellite-Delivered Network Signals."[1]

Background

In its Notice of Inquiry in ET Docket No. 05-182 ("NOI"), the Commission seeks, among other things, information and comment on current regulations that identify households that are unserved by local analog broadcast television stations in order to determine if the regulations may be accurately applied to local digital broadcast stations for the same purpose. Hammett & Edison, Inc. prepared engineering statements and associated figures, dated June 17 and July 5, 2005, in support of the initial and reply comments of EchoStar Satellite L.L.C. to that NOI. Partly in response to requests by some of the other commenting parties, this statement provides additional data.

Description of Measurement Equipment and Collection Method

The data documenting temporal variations of signal level reported in our June 17 statement[2] were collected using a spectrum analyzer-based system, which was originally developed by Hammett & Edison, Inc. about 10 years ago.[3] For this collection effort, a consumer television receiving antenna was used.[4] The antenna gain at the channels of interest was determined using the substitution (transfer) method,[5] [6] although gain information is unnecessary for purposes of showing temporal variation. This antenna was installed at approximately 30 feet AGL at the Hammett & Edison, Inc. offices in Sonoma, California. With the exception of Stations KRCB-DT, Channel D23, and KTLN-DT, Channel D47, all of measured stations are in or near the main beam of the receiving antenna.

The receive carrier level (RCL) of each DTV signal was determined by integrating the power in 30 kHz samples, equally spaced in frequency, over 5.38 MHz. Appropriate correction factors were applied to convert the Gaussian response of the 30 kHz resolution bandwidth filter to its equivalent

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1 FCC 05-94, adopted April 29, 2005.

2 Comments of EchoStar Satellite LLC, Engineering Statement, pp. 6–7 and Figs 1–3.

3 Stanley Salek and Robert P. Smith Jr., "Transmitting Site Evaluation Using a Mobile Spectrum Measurement System," *50th Annual Broadcast Engineering Conference Proceedings,* National Association of Broadcasters, 1996, pp. 278-285. A soft copy is available at http://www.h-e.com/pdfs/ss_nab96.pdf

4 Radio Shack Model Type VU-90 combination VHF/UHF antenna.

5 C. Balanis, Antenna Theory. (New York: John Wiley & Sons Inc., 1982).

6 G. Evans, Antenna Measurement Techniques, (Boston: Artech House, 1990).

noise bandwidth,[7] to correct for the response of the envelope detector and logarithmic amplifier circuits, and to remove the added power of the DTV pilot.

When the DTV signal is within 10 dB of the analyzer noise floor, the displayed signal level will be higher than the actual value by a factor of up to 7.5 dB higher than the true value.[8] Although the measurements of the stations were in some cases near the noise floor of the analyzer, no correction factor was applied, except that values below -78.5 dBm (within 0.5 dB of the analyzer noise floor) were discarded. The discarded data amounted to about 0.7% of the data in the case of KNTV-DT, which was the only station that was sufficiently weak that more than a few data points had to be discarded. Therefore, some of the reported signal levels for KNTV-DT (and some of the other stations) may be *lower* than reported in the data, and the true statistical distribution would have additional weight at the weakest signal levels.

Measurements were taken approximately every 12 seconds over the period 20:35 (local time) May 17 until 15:33 May 31, 2005. During that time, the recording system was stopped three times.[9] Of the 15 stations monitored, four (D12, D41, D43, and D49) operated continuously, two left the air most nights from midnight until about 7 am (D23 and D47), one station (D27) left the air on May 27 and did not return during the monitoring period, and the remaining stations left the air sporadically for minutes to hours at various times for reasons unknown. The data during these off-air periods were not included in the analysis. As shown in the summary chart, a maximum of 99,148 signal level measurements were taken for each station.

Additional Data

Data for six representative stations were reported in the June 17 statement, of the total 15 stations monitored. The remaining nine datasets are reported here in the same format, along with some additional information. Eight of the stations are located at Sutro Tower in San Francisco, and operate using one of three shared DTV antennas, all having identical characteristics other than height and power. The remaining station, Channel D27, is located at San Bruno Mountain, just south of San Francisco.

The most striking feature across all of the receive signal level data is the significant fade that occurs from the afternoon of May 18 until the evening of May 19. Weather parameters, including barometric pressure, temperature, humidity, wind speed, and rainfall amount were recorded concurrently with the signal strength data, and are reported in Figure 2.[10] Comparison of the signal level data with the

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7 "Noise Measurements Using the Spectrum Analyzer," Tektronix Application Note 26AX-3260.

8 "Spectrum Analyzer Fundamentals," Tektronix Application Note 26W-7037-1.

9 May 18 13:08–18:05, May 20 17:32–19:28, and May 27 14:10–16:52.

10 Rainfall amount has been converted to rain-rate.

weather data shows a strong inverse correlation between rain rate and signal level. Although significant rainfall at the receive site occurred only during a portion of this fade, it can be expected that there was significant rainfall at some point along the path during the entire period.

Summary data for the fifteen stations are provided below:

Channel	Callsign	Prin. Community	ERP, kW	Median RCL	Valid Meas.	Path Length	Type of Path
D12	KNTV-DT	San Jose	8.9	-73.5 dBm	98,427	142 km	obstructed
D19	KBWB-DT	San Francisco	383	-67.8	95,214	59.7	obstructed
D23	KRCB-DT	Cotati	4.7	-64.3	72,170	11.6	line of sight
D24	KGO-DT	San Francisco	561	-63.5	95,430	59.7	obstructed
D27	KTSF-DT	San Francisco	220	-68.6	69,550	67.3	obstructed
D29	KPIX-DT	San Francisco	1000	-60.5	94,588	59.7	obstructed
D30	KQED-DT	San Francisco	777	-60.2	95,202	59.7	obstructed
D33	KMTP-DT	San Francisco	500	-63.8	89,633	59.7	obstructed
D34	KFSF-DT	Vallejo	150	-66.6	95,413	59.7	obstructed
D39	KCNS-DT	San Francisco	468	-69.2	95,036	59.7	obstructed
D41	KKPX-DT	San Jose	1000	-55.4	99,147	67.3	obstructed
D43	KCSM-DT	San Mateo	536	-63.7	99,148	59.7	obstructed
D45	KBHK-DT	San Francisco	400	-65.5	95,141	59.7	obstructed
D47	KTLN-DT	Novato	230	-61.5	73,201	19.6	line of sight
D49	KSTS-DT	San Jose	200	-71.1	98,957	102	marginal

Diurnal Variation

NAB's engineering consultant challenges the use of signal strength measured during the daytime as the median for calculating 90% time reliability on the ground that, "field strength measurements [under Section 73.686(d)], which are taken during the daytime, will typically be lower than at night ...." This statement is based upon a specious reading of FCC Report No. R-6602.[11] As a threshold matter, that report supported the development of so-called area method propagation, which makes no use of the actual terrain between the transmit and receive antennas, and has been wholly supplanted by point-to-point propagation models, such as ILLR. Moreover, even if the cited report were applicable to this discussion, it states that, "the differential between the day and night field strengths was negligible in the VHF bands ...."

The referenced report goes on to state, "In the UHF band, a diurnal correction was applied for adjusting the daytime mobile measurements ...." The suggested correction is, at most, 3 dB, and varies according to a formula relating the transmit and receive antenna heights and a horizon calculation that assumes that the terrain is smooth along the transmit-receive path. The formula is based upon an assumption of propagation over smooth earth, which has been rendered wholly obsolete

[11] Jack Damelin, *et al.*, "Development of VHF and UHF Propagtion Curves for TV and FM Broadcasting," FCC Report No. R-6602, September 7, 1966.

by the use of irregular terrain models, such as ILLR. Just as the FCC does not recognize diurnal variation for television stations, we are aware of no ITU or other reports recognizing such variation.

As a matter of interest, we calculated the median signal levels on an hourly basis for the 15 stations described above over the two-week data collection period, and the data from each hour of each 24-hour day were combined for analysis. The hourly median values were calculated and normalized by subtracting the global median for each station. The results are plotted in Figure 3. Clearly, there are some outlier points, and one station (KSTS-DT, Channel D49) was typically stronger by 4.5 dB late at night (1 AM) and typically weaker by 2.5 dB at mid-afternoon (2 PM). However, some stations (KRCB-DT, Channel D23, KTSF-DT, Channel D27, and KTLN-DT, Channel D47) were typically stronger during the day than at night – the reverse of what NAB's consultants postulate. As shown by the trend line, for the two-week period of data collection, the typical hourly variation for all stations over a 24-hour period is less than ±1 dB. More importantly, the variations are not systematic and so cannot be corrected.

It is incorrect to suggest that day-night variation introduces a systematic bias in field measurements. If that were the case, the FCC would issue separate daytime and nighttime authorizations for television stations, as it does for AM stations. Neither the available literature nor the data we collected support NAB's claim that field strength measurements taken during the daytime are likely to be below the median value. It follows that the use of daytime measurements as the median field strength is perfectly acceptable. Of course, measurements of median field strength, whether taken during the day or at night, must be adjusted for 90% or greater time reliability.

Accounting for Antenna Pointing Errors

As discussed above and in our June 17, 2005, statement,[12] few viewers of over-the-air television have or use outdoor antennas that can be rotated. Because in most markets, not all television stations transmit from a common site, reception of one or more stations will be impaired due to the reduced off-axis performance of the receiving antenna. NAB's engineering consultants argue instead that, "... in many cases, a viewer will have no need to reorient an antenna to point it towards a transmitter in a different direction."[13] If NAB's position were correct that antenna adjustment is not necessary in many cases, then it would be reasonable to take field strength measurements for several stations in only a single orientation.

[12] Comments of EchoStar Satellite LLC, Engineering Statement, p. 3.

[13] Reply Comments of NAB, Engineering Statement of Meintel, Sgrignoli, & Wallace, July 5, 2005, p. 3.

While the optimal orientation cannot be known *a priori* for a particular location, a more reasonable way to account for antenna mis-orientation would be as follows, when several stations are being measured to determine DTV field strength.

1. Orient the measurement antenna in the direction which maximizes the value of field strength for the first station to be measured, and record the field strength for that station, as described in Section 73.686(d)(2)(iv).

2. While maintaining this antenna orientation, record the field strength for the other stations to be measured.

3. Repeat steps 1 and 2 in turn for each of the other stations to be measured.

This procedure is compatible with the present rule, which specifies a cluster measurement of five points in the area of the subscriber's antenna. When measuring four network stations, for instance, the above procedure will result in 20 measurements for each station: one for each antenna orientation at each of the five cluster measurement points. From those data, one can calculate the median of the 20 measurements in units of dBu, and use that as the measurement result.

When it is unnecessary for the viewer to reorient his antenna for each station, as NAB states is often not done, this technique will result in the same result as the present technique as defined generally in Section 73.686(d). However, when the receive antenna mis-orientation results in sub-optimum reception for some stations, this technique will account for the typical signal strength penalty.

Television Equipment Survey

EchoStar retained a professional survey firm, The Survey Center of Mashpee, Massachusetts, to conduct a telephone survey of television viewers who rely upon off-air reception. The complete survey is appended to this filing. The survey sample was selected randomly and equally from four databases, which together comprise a nationwide sample. Each county in the U.S. is assigned by Nielsen Media Research into one of four databases, A, B, C, and D, based largely upon its population density.

The Survey Center characterizes the results of the nationwide sample as having a margin of error of 3.19% at a 95% confidence factor. The results of each of the individual "population density band" results are reported to have a margin of error of 6.39% at a 95% confidence factor. A 95% confidence factor means that if the study were repeated 100 times, for 95 of these times the results would be the same, plus or minus the margin of error.

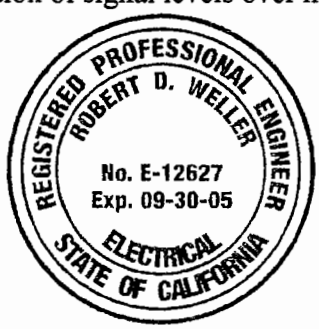
Antenna and rotor usage. Of the households that rely on over-the-air ("OTA") reception, about one-half (49%) have a rooftop antenna,[14] with the other half using an indoor antenna. Of the households having an outdoor antenna, 41% of these reported that the antenna had a rotator installed.[15] In other words, just 20% of the households surveyed that relied on OTA reception had outdoor antennas that could be rotated. Even in the more rural counties ("C" and "D"), only 25–27% of the households that rely on OTA reception had outdoor antennas that could be rotated.

Height of receiving antenna. The Commission has recognized that most homeowners typically install outdoor antennas on roofs, rather than on free-standing towers. In my experience, rooftop installations are typically 8–10 feet above the roof height, so single-story homes have antennas that are 20 feet (or less) above ground, while two-story homes have antennas that are 30 feet (or less) above ground. The EchoStar survey shows that 49% of U.S. households that rely upon antennas for television reception live in single-story homes. The fraction increases to 57% in rural areas. Therefore, the assumed use of receiving antennas located at 20 feet above ground, or less, rather than 30 feet above ground, is not unreasonable in many or most cases. Finally, for households relying upon indoor antennas, 71% have their TV receiver located on the first floor. In essentially all of those cases, the receiving antenna will therefore be located less than six feet above ground. To the extent that indoor antenna reception might be assumed for DTV, an appropriate adjustment for this low antenna height will be required in most cases.

List of Figures

In carrying out these engineering studies, the following attached figures were prepared by me:

1. Measured DTV signal levels (1A–1C repeated from June 17, 2005, statement),
2. Weather conditions during measurement period, and
3. Diurnal variation of signal levels over measurement period.



/s/ Robert D. Weller
Robert D. Weller, P.E.

August 23, 2005

[14] Antennas located in attics were considered to be rooftop antennas, since "outdoor" models are typically used.
[15] It was not asked whether the rotor was functional.

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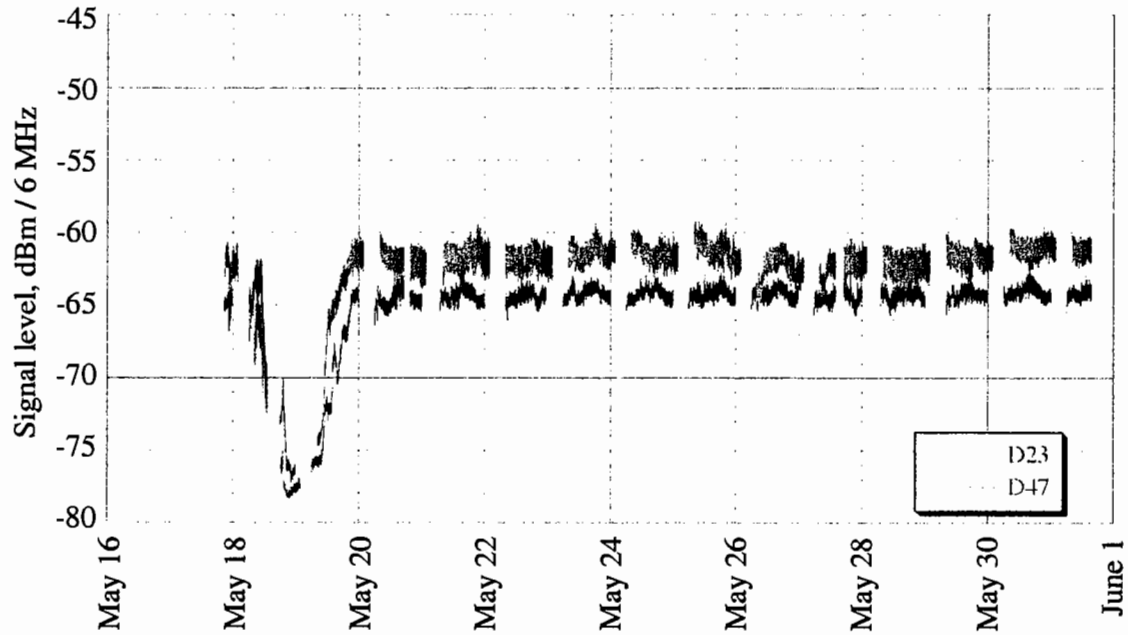
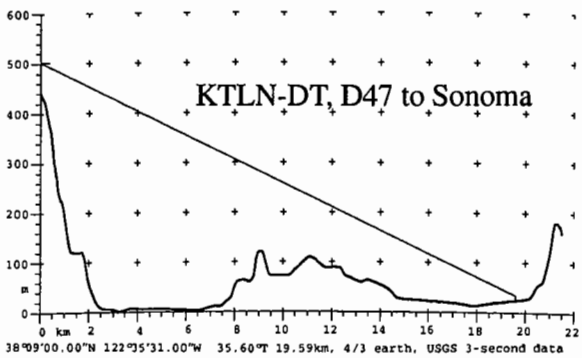
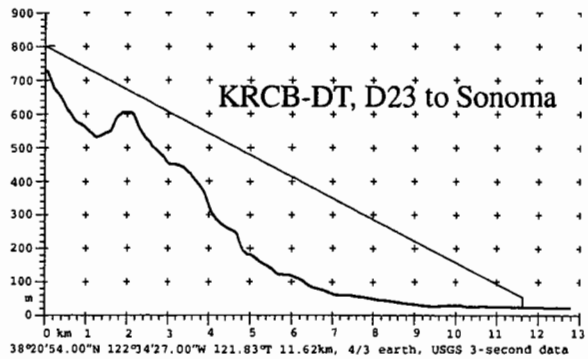
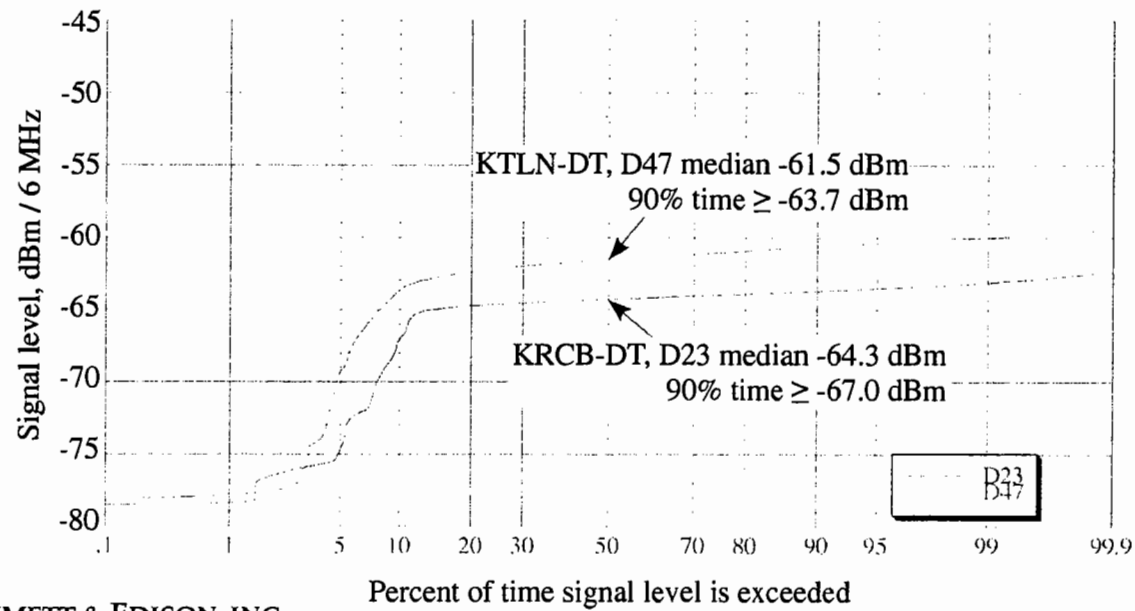
Measured DTV Signal Levels – Short Line-of-Sight Paths









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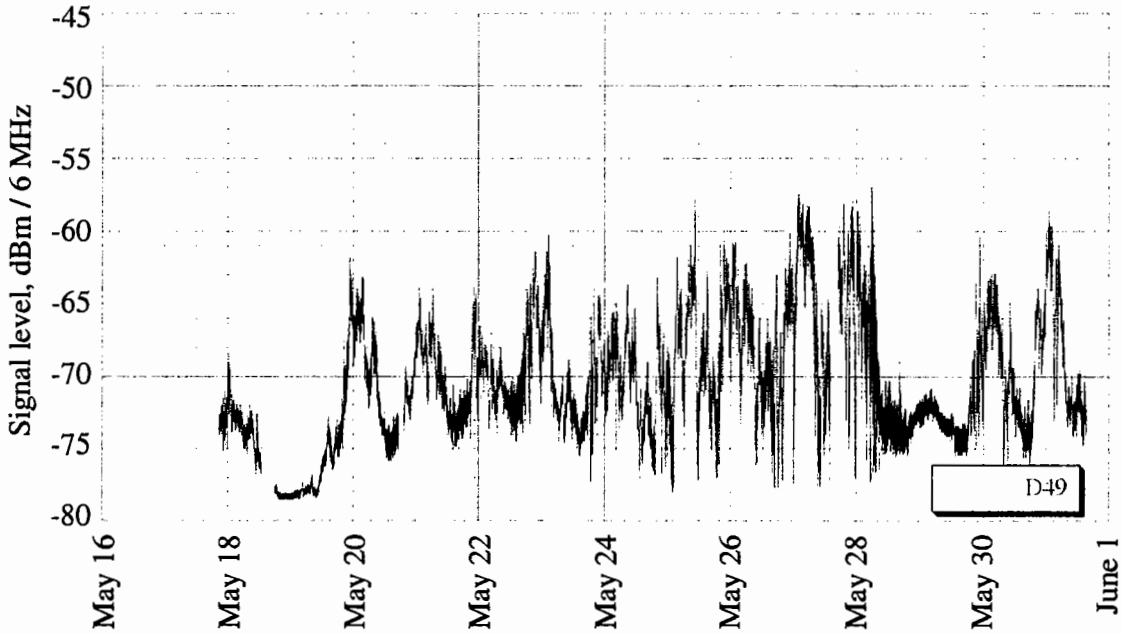
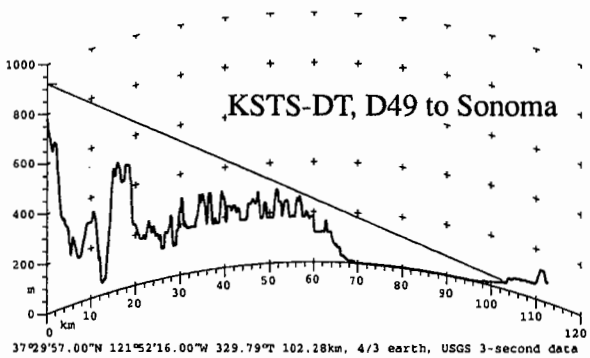
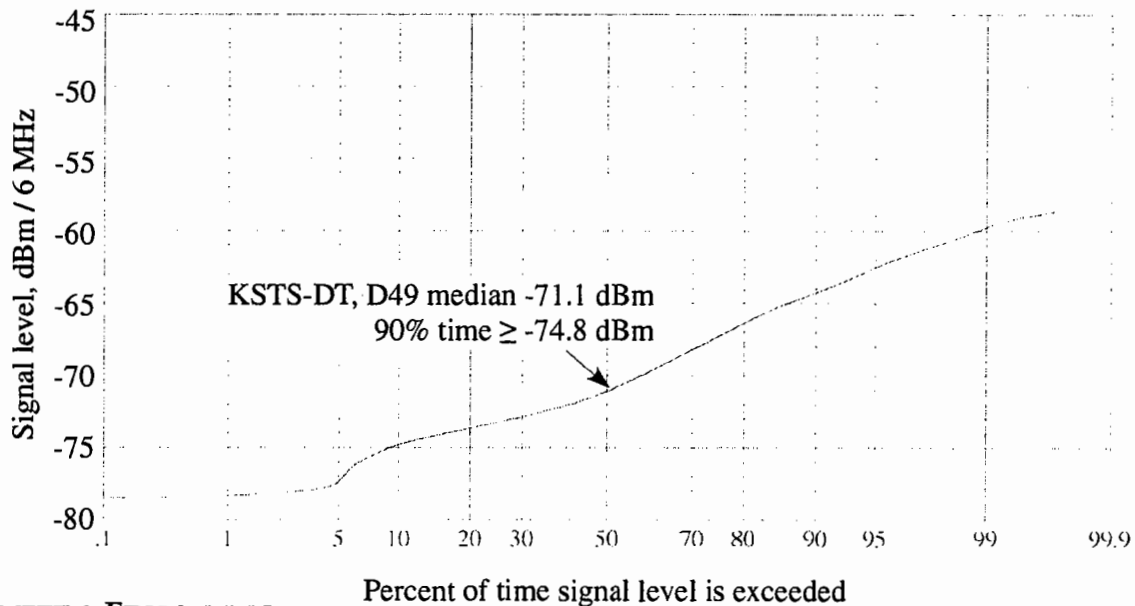
Measured DTV Signal Levels – Long Line-of-Sight Path







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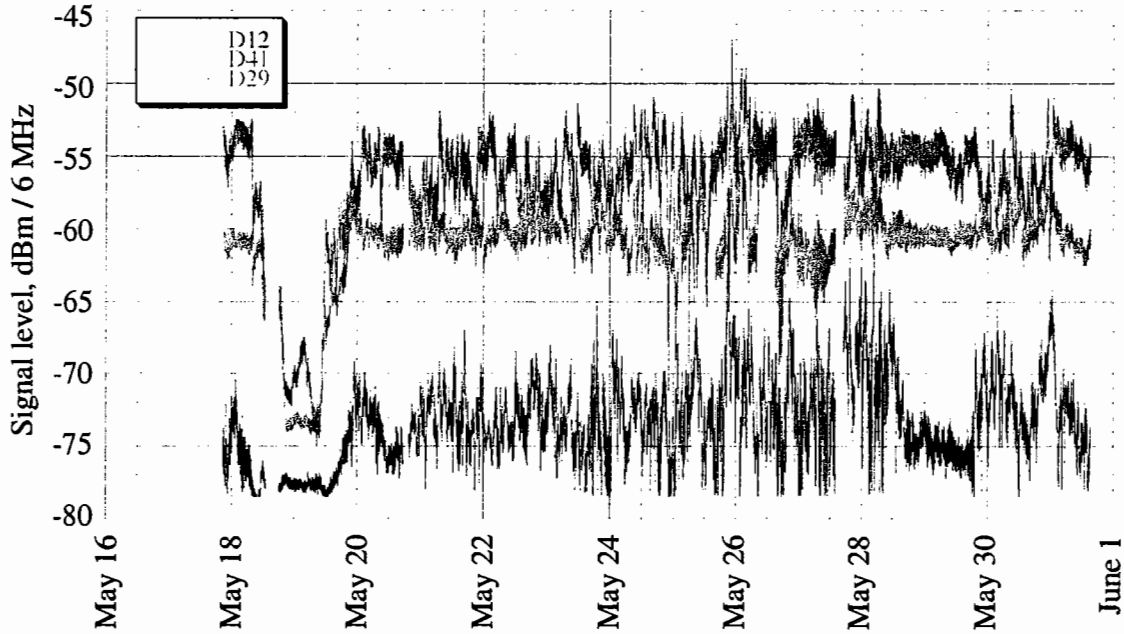
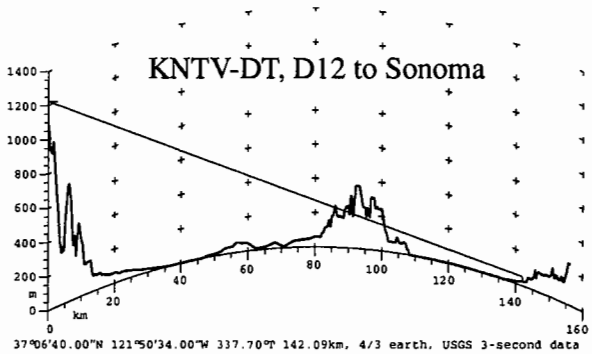
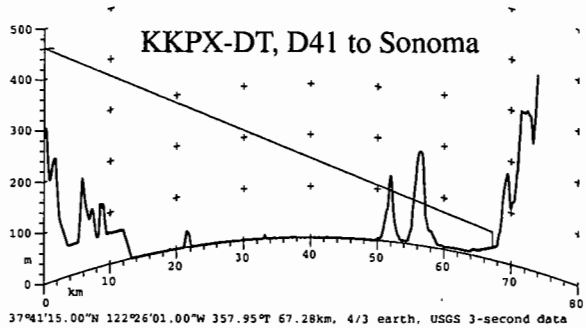
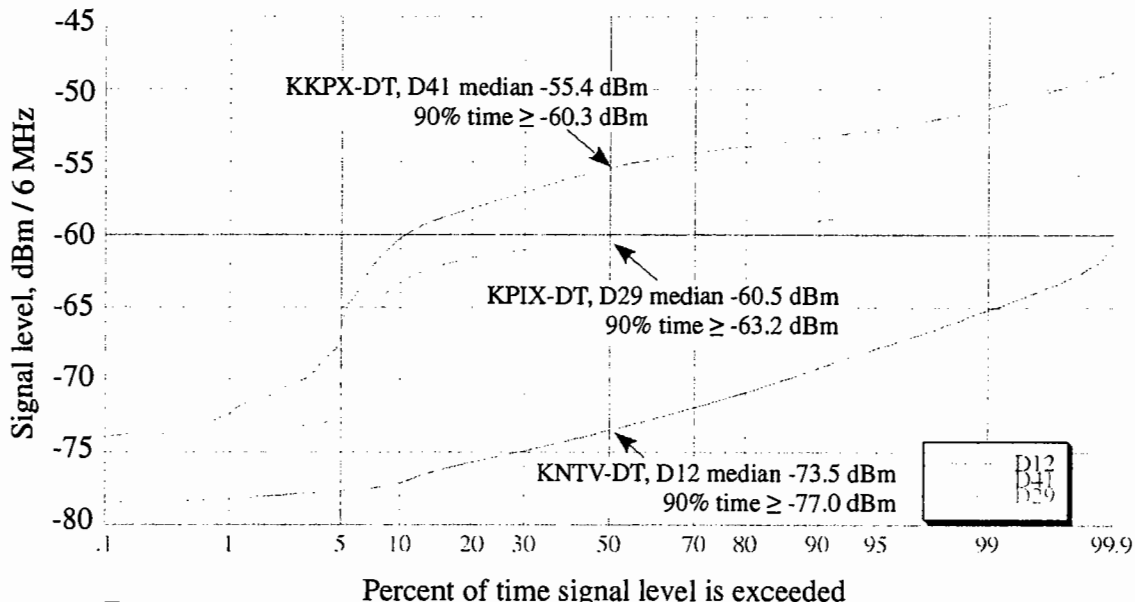
Measured DTV Signal Levels – Obstructed Paths









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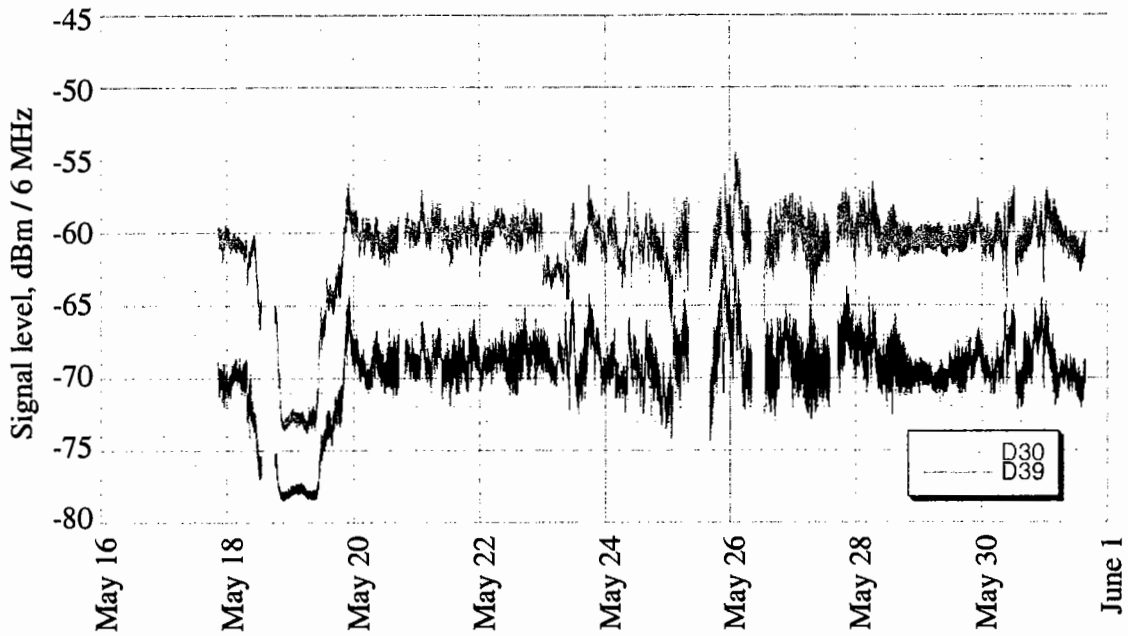
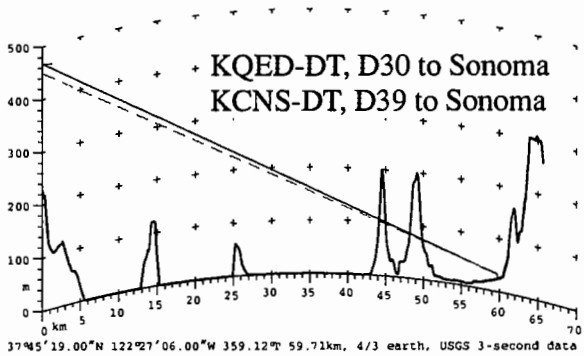
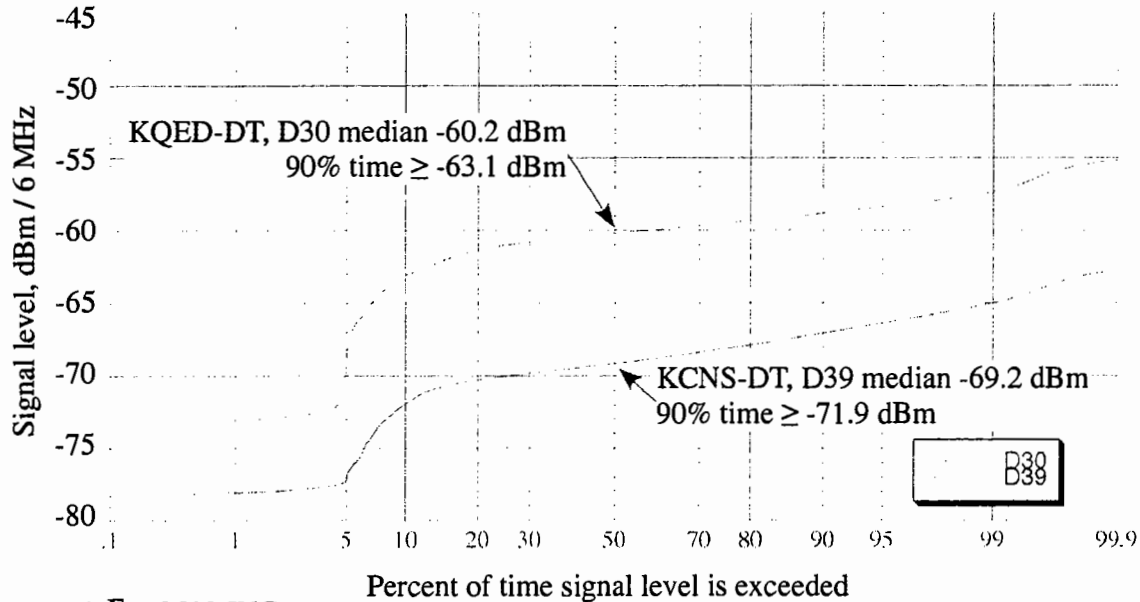
Measured DTV Signal Levels – Channels D30 and D39







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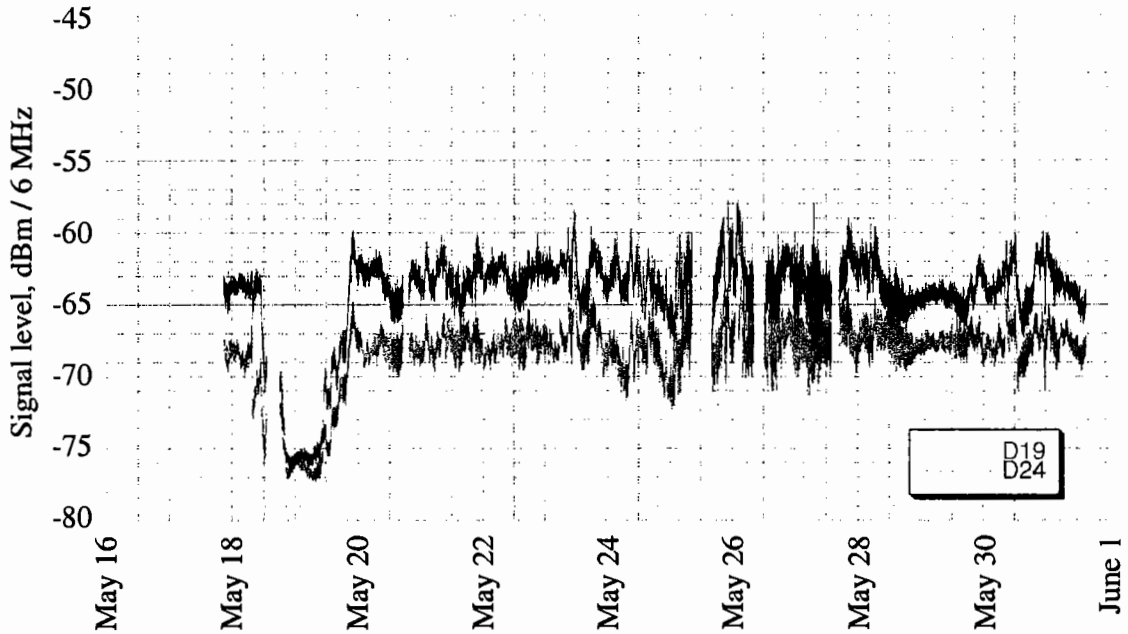
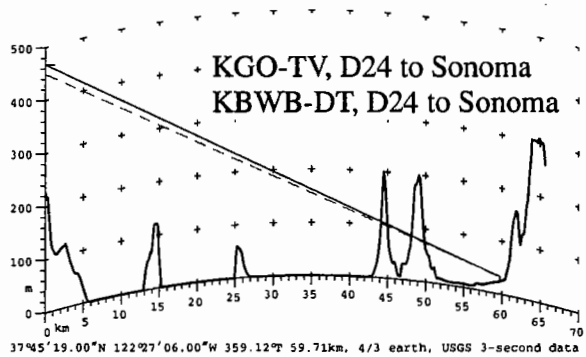
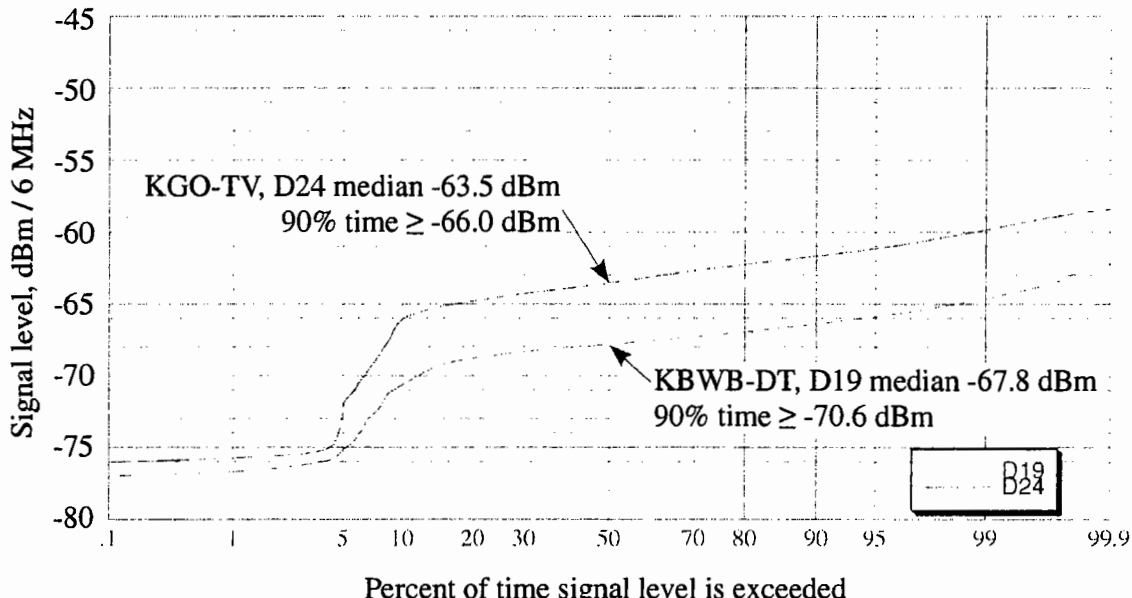
Measured DTV Signal Levels – Channels D19 and D24







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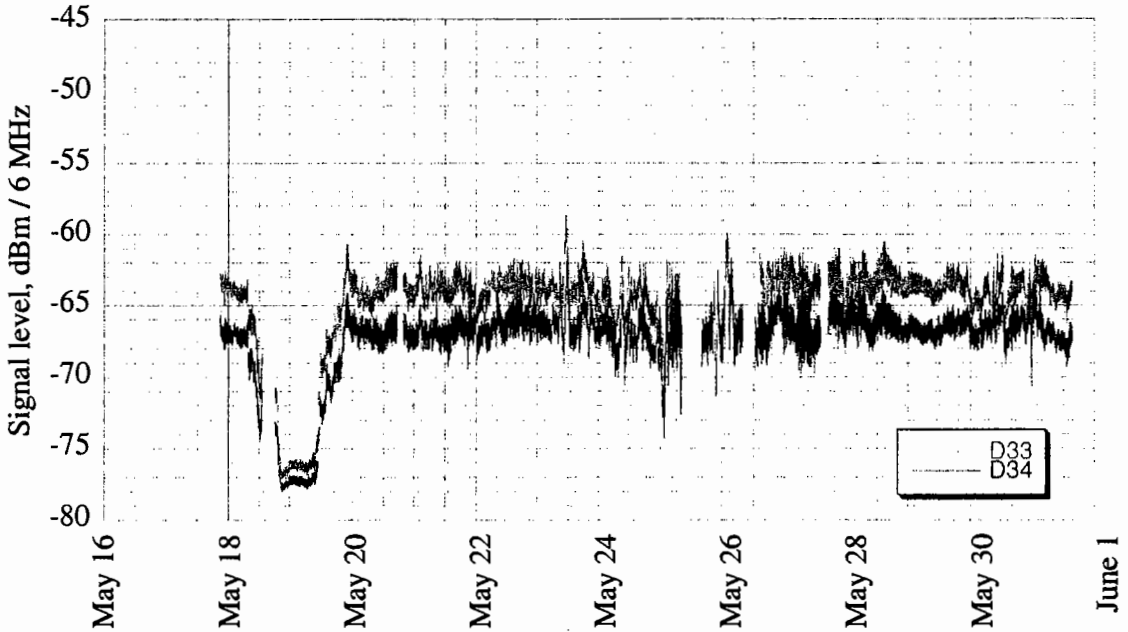
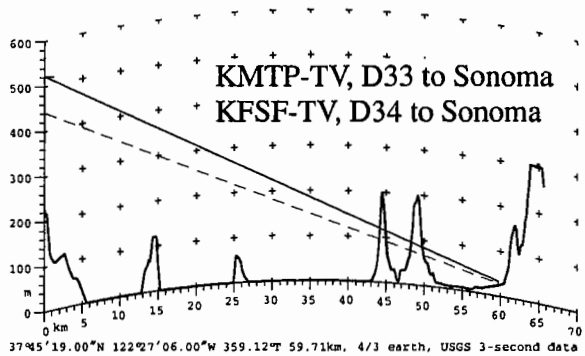
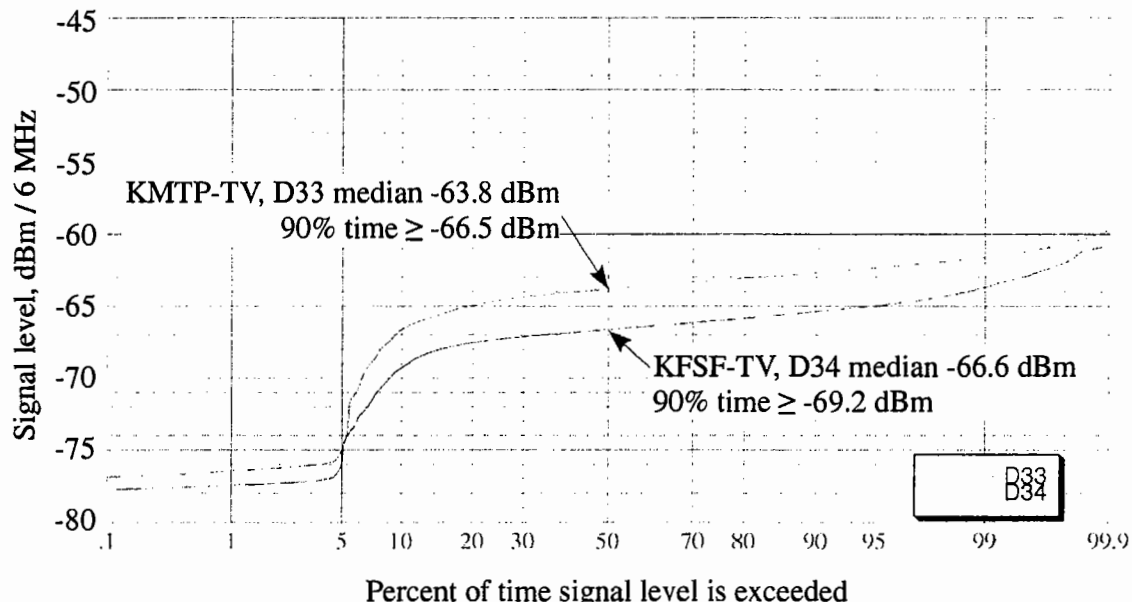
Measured DTV Signal Levels – Channels D33 and D34







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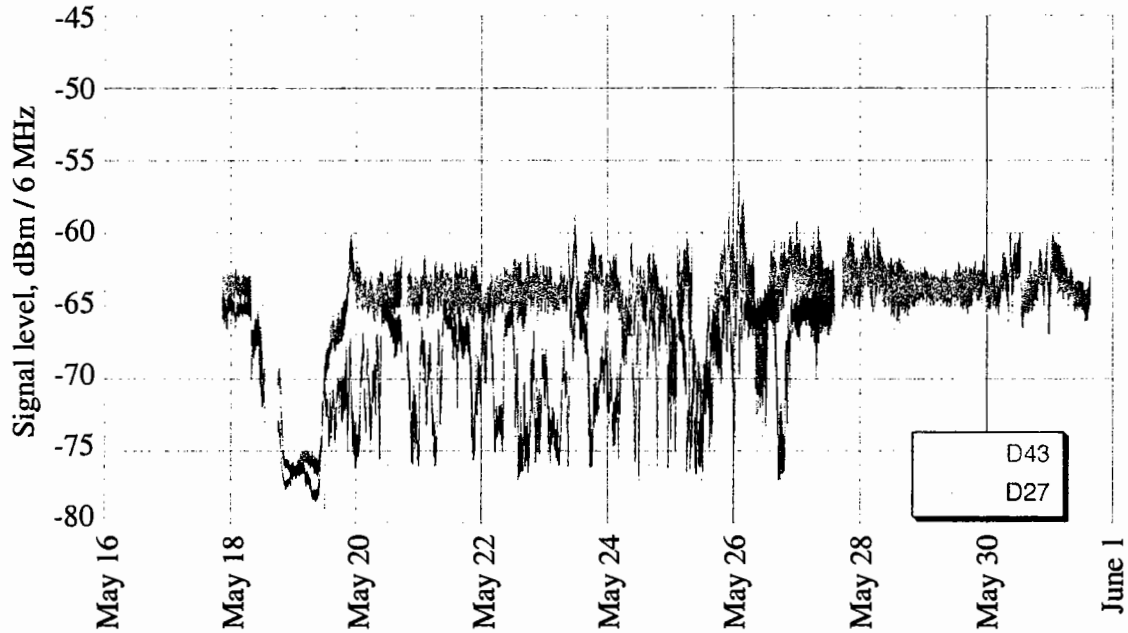
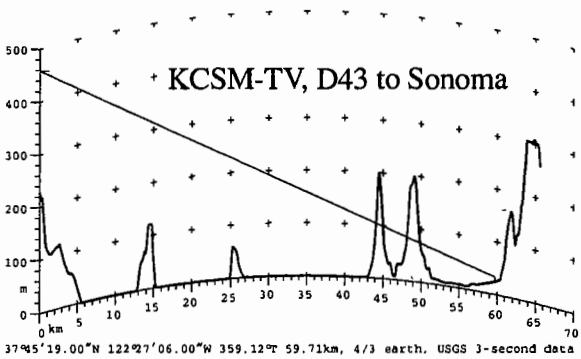
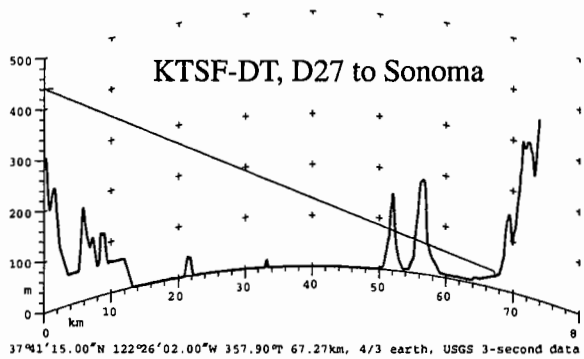
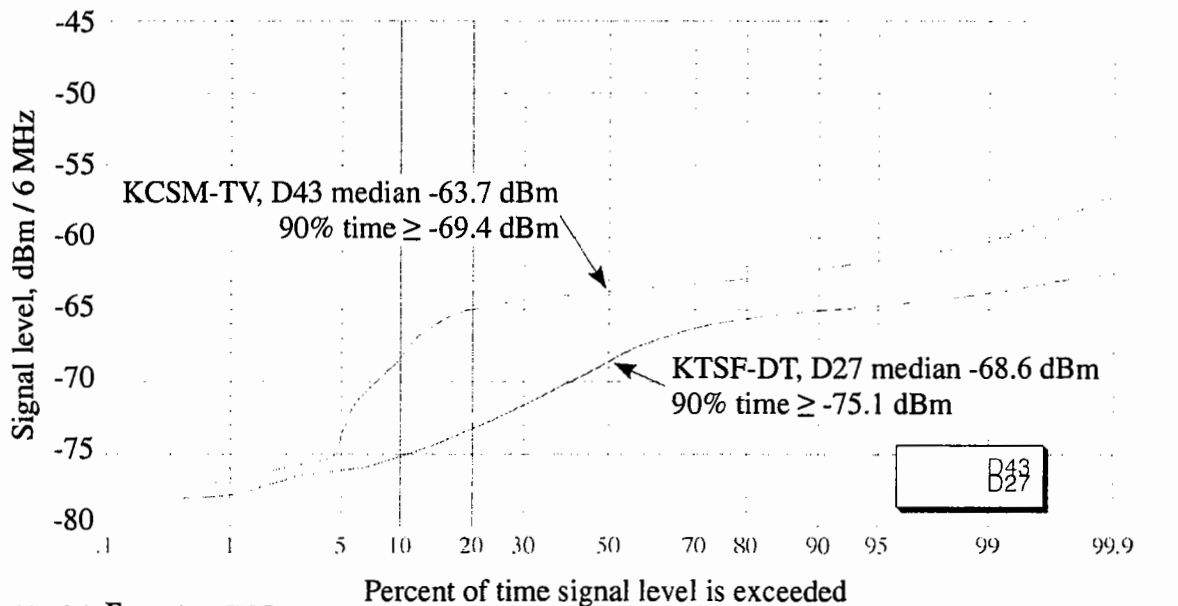
Measured DTV Signal Levels – Channels D27 and D43









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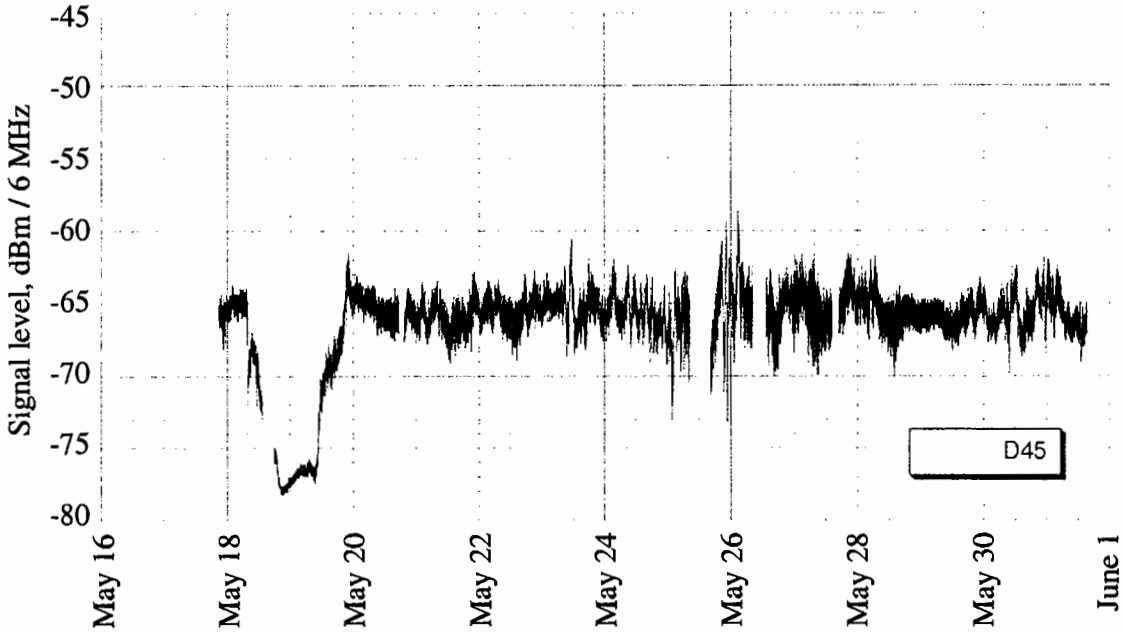
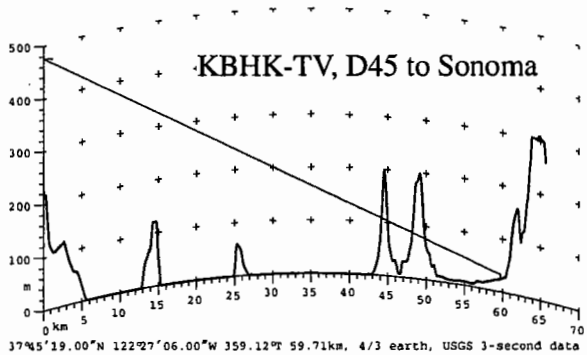
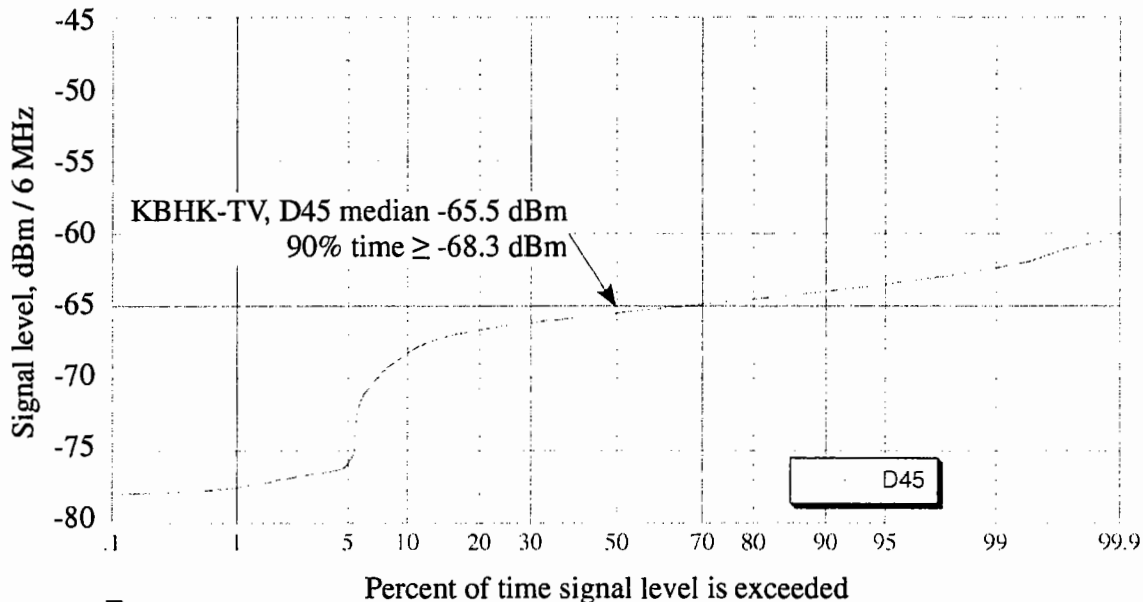
Measured DTV Signal Levels – Channel D45







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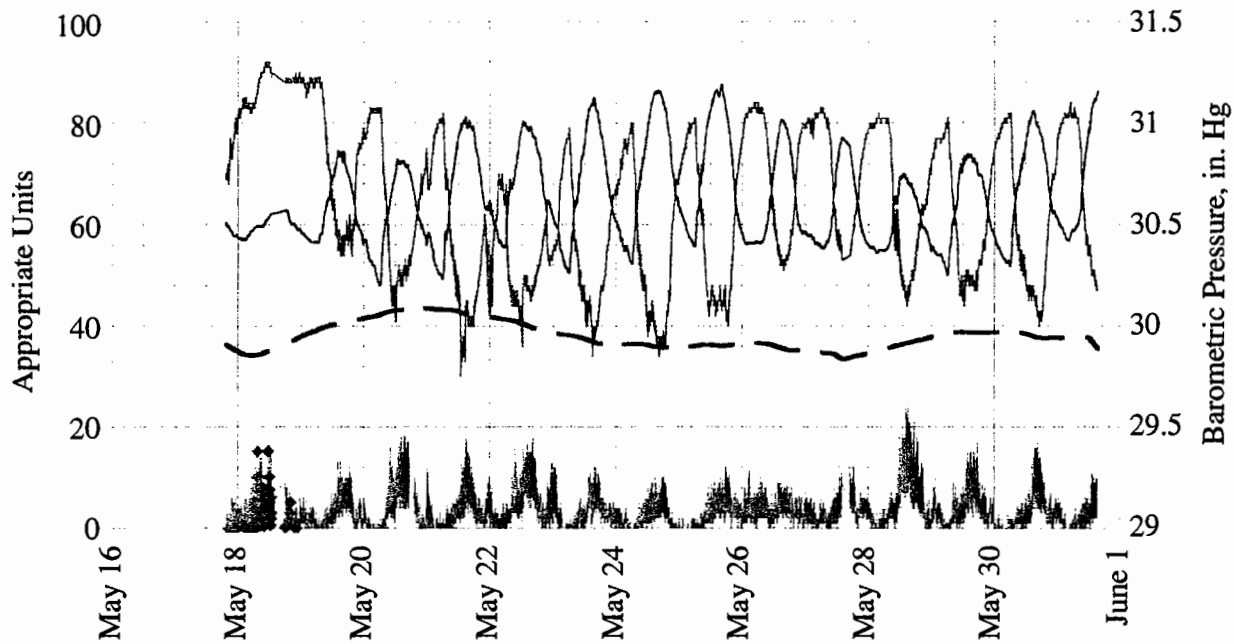
Weather Conditions During Measurement Period



Legend		
— —	Barometric Pressure	in. Hg
———	Temperature	°F
———	Humidity	%
———	Wind Speed	mph
◆◆	Rain Rate	mm/hr

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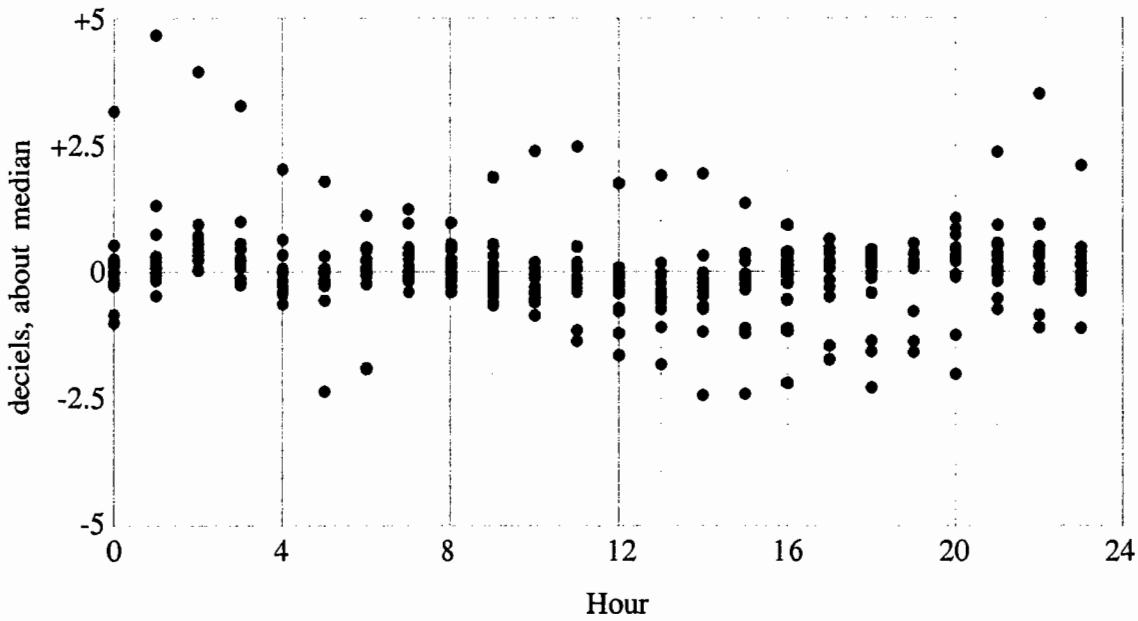
Diurnal Variation of Signal Level Over Measurement Period



Zero decibels represents the median signal level, calculated for each station over the entire measurement period. Data points represent the calculated hourly median for each station.