Reply Comments FCC 05-94/ET 05-182

This listing of commenters does not include the Engineering comments submitted by Hammett and Edison on behalf of EchoStar Satellite L.L.C. The comment filings are separate due to the fact that they were submitted in a format that prevents their inclusion in this integrated electronic document.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Technical Standards for Determining	)	ET Docket No. 05-182
Eligibility for Satellite-Delivered Network Signals	)	
Pursuant to the Satellite Home Viewer	)	
Extension and Reauthorization Act of 2004	)	

REPLY COMMENTS OF THE ABC, CBS, AND NBC TELEVISION AFFILIATE ASSOCIATIONS

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Summary

The comments filed in this proceeding come from a variety of industries potentially affected by the Commission's recommendations to Congress in this matter. Some parties urge the Commision to concentrate on developing a predictive model, but SHVERA only permits the Commission to *recommend* to Congress that it should adopt a predictive model, not implement one. Other comments show that digital reception performance is not based on the price or brand of DTV receivers and that there will soon be digital smart antennas that can instantaneously alter their electrical characteristics, including gain, orientation, and pattern. And several sets of comments show that the current digital signal intensity thresholds set forth in Section 73.622(e)(1) of the Commission's rules are the appropriate metric for determining digital service under SHVERA.

EchoStar, however, in a stab at the very heart of the distant digital network signal compulsory license scheme, disagrees with this conclusion about the adequacy of the current digital signal strength standards. But EchoStar's approach is deeply flawed.

The cumulative effect of all of the alleged shortcomings EchoStar claims to find with the current signal strength standards leads to absurd noise-limited field strengths: 101.5 dBu for low VHF, 98.6 dBu for high VHF, and 98.4 dBu for UHF. In other words, EchoStar would have the Commission believe that its current noise-limited field strengths for DTV are too low by 73.7 dB for low VHF, by 62.8 dB for high VHF, and by 57.6 dB for UHF! EchoStar's wholly fanciful digital signal strength standards are reminiscent of similar outlandish adjustments to the Grade B planning factors that EchoStar (and also the Satellite Broadcasting and Communications Association) proposed five years ago in ET Docket No. 00-90. Just as the Commission did five years ago in the analog context, it should reject EchoStar's "adjustments" to the DTV planning factors which form

the basis for the entire digital television transition.

The real cumulative effect of any legitimate concerns with the adequacy of the DTV planning factors amounts to less than 6 dB. But, as shown extensively in Network Affiliates' opening comments, there is a safety margin of 9 dB for low VHF, 9 dB for high VHF, and 6.6 dB for UHF already built into the planning factors if a real-world reception installation is assumed with a readily available consumer antenna and low-noise amplifier ("LNA"). The Commission has previously recognized that LNAs are typical in fringe areas, and the ATSC recommends their use for digital reception. Moreover, these safety margins include only the advantage in system noise figure due to the LNA and not any of the actual gain that the LNA can deliver to the receiver. If the 15 dB to 20 dB additional gain that the LNA provides to the signal is also taken into consideration, then it is plain that the current digital signal strength standards in Section 73.622(e)(1) are far more than adequate to ensure good-quality DTV reception.

EchoStar also makes a number of other assertions, each of which would essentially permit the misorientation of antennas, that, while not expressly affecting the digital signal strength standards themselves, would have a negative effect on local network stations by penalizing them for inappropriate factors and, consequently, shrinking their local service areas. None of these assertions has any merit. EchoStar's attempts to avoid the use of rotors or to not fully orient an antenna properly are bad engineering practice and contrary to the Commission's long-standing expectations.

For the foregoing reasons, Network Affiliates respectfully request that the Commission reject EchoStar's purported "adjustments" to the DTV planning factors and EchoStar's other suggestions that would thwart localism and shrink network affiliate service areas.

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REPLY COMMENTS OF THE ABC, CBS, AND NBC TELEVISION AFFILIATE ASSOCIATIONS

The ABC Television Affiliates Association, the CBS Television Network Affiliates Association, and the NBC Television Affiliates Association (collectively, the "Network Affiliates"), by their attorneys, hereby reply to the comments filed in response to the *Notice of Inquiry* ("*Notice*"), FCC 05-94, released on May 3, 2005, in the above-referenced proceeding.[1]

The comments filed in this proceeding come from a variety of industries potentially affected by the Commission's recommendations to Congress in this matter. Both DIRECTV, Inc. and the Consumer Electronics Association ("CEA") urge the Commission to concentrate on developing a predictive model.[2] However, as pointed out by both Network Affiliates and the National Association of Broadcasters ("NAB"), SHVERA, as enacted, requires distant digital network signal eligibility to be determined by a complex site testing scheme.[3] SHVERA only permits the Commission to recommend to Congress that it should adopt a predictive model, and both Network Affiliates and

[1] Network Affiliates collectively represent approximately 600 local television stations affiliated with the ABC, CBS, and NBC Television Networks.

[2] *See* DIRECTV Comments at 2; CEA Comments at 1.

[3] *See* Network Affiliates Comments at 42-43; NAB Comments at 3-4.

NAB agree that the Commission should make such a recommendation, but, for the many reasons expressed in their comments, a predictive methodology should not be implemented until after the DTV transition is complete.[4]

In other comments, ATI Technologies, Inc. ("ATI") shows that digital reception performance is not based on the price or brand of DTV receivers, that current DTV receivers perform well in a wide range of even less than ideal reception conditions, and that, "soon, all DTV sets and receivers should perform at least as well as the most advanced equipment available today."[5] ATI's comments are fully consistent with the views expressed by Network Affiliates and NAB in their respective comments. Viamorph, Inc. informs the Commission of its development of a digital smart antenna that can alter its electrical characteristics, including gain, orientation, and pattern, as directed by DTV receiver-resident software performing virtually instantaneous signal analysis.[6] And the Association for Maximum Service Television, Inc. ("MSTV") shows that the current digital signal intensity thresholds set forth in Section 73.622(e)(1) of the Commission's rules are the appropriate metric for determining digital service under SHVERA, a conclusion with which both Network Affiliates and NAB concur.

EchoStar Satellite L.L.C. ("EchoStar"), however, disagrees with this conclusion about the adequacy of the current digital signal strength standards. Because EchoStar's various assertions stab at the very heart of the distant digital network signal compulsory license scheme, these reply comments focus on detailing why EchoStar's claims are seriously flawed.

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[4] *See* Network Affiliates Comments at 43-44; NAB Comments at 33-38.

[5] ATI Comments at 3, 9.

[6] *See* Viamorph Comments at 3-4.

I. The DTV Planning Factors Established Appropriate Signal Strength Thresholds for Reception of Real-World Broadcast Signals, and EchoStar's "Adjustments" Are Groundless

EchoStar's comments attack SHVERA's current requirements, and the Commission's current rules, concerning both digital signal strength standards in Section 73.622(e)(1) and site testing methodology in Section 73.686(d), in what amounts to a mud-slinging kitchen-sink approach. Presumably, EchoStar hopes that if any mud sticks to the sink, then it will have succeeded in shrinking local network stations' coverage areas, which, as Network Affiliates extensively demonstrated, is the antithesis of localism, which has always been the guiding principle at the core of the distant signal compulsory license.[7]

But EchoStar's approach is unfocused and deeply flawed. It appears to be intentionally unfocused in at least one way: The cumulative effect of all of the alleged shortcomings EchoStar claims to find with the current signal strength standards leads to absurd adjustments, as shown below. EchoStar's approach is also unfocused (either intentionally or unintentionally) in a second way in that it presents no concrete suggestions for Commission action. Close scrutiny of EchoStar's various claims shows that they are flawed and without merit, and, consequently, it is not surprising that EchoStar proffers no substantive solutions since there is no substance underlying the complaints.

If each of EchoStar's complaints about digital reception impairments affecting the signal intensity necessary to provide good-quality DTV reception were taken at face value, they would result in the additions to the Commission's DTV planning factors shown in Table 1.

[7] *See* Network Affiliates Comments at 1-13.

EchoStar Proposed Additions to the DTV Planning Factors *Table 1*

Parameter	Channels 2 to 6	Channels 7 to 13	Channels 14 to 69
Current FCC Median Field Intensity	27.8	35.8	40.8
Indoor Antenna Penalty[a]	8	10	9
Increase to 99% Time Probability[b]	0.6	4.7	17.5
White Noise Enhancement[c]	2	2	2
Man-Made Noise[d]	30	13	0
Impedance Mismatch[e]	3	3	3
Receiver Sensitivity Adjustment[f]	2.6	2.6	2.6
Building Penetration Loss[g]	27.5	27.5	23.5
EchoStar Proposed Median Field Intensity	101.5 dBu	98.6 dBu	98.4 dBu

[a] Derived from 1979 ITS study cited by EchoStar for each band, rounded to nearest whole number.
[b] Figures for the high VHF and UHF bands are taken from EchoStar Comments; figure for the low VHF band is by linear extrapolation.
[c] Taken from EchoStar Comments.
[d] Figure for the low VHF band is taken from EchoStar Comments; figure for high VHF is extrapolated for mid-frequency of the band from 20 dB figure given at 137 MHz; figure for UHF is assumed to be 0 dB since EchoStar does not make an argument that man-made noise is problematic at UHF frequencies.
[e] Taken from EchoStar Comments.
[f] Taken from EchoStar Comments to be representative of the typical receiver across all channels.
[g] Figures are derived as the average of the figures given by EchoStar from a 1963 study in the New York City area.

As Table 1 shows, the cumulative effect of EchoStar's various "adjustments" would result in digital signal intensity thresholds of 101.5 dBu for low VHF, 98.6 dBu for high VHF, and 98.4 dBu for UHF. In other words, EchoStar would have the Commission believe that its current noise-limited field strengths for DTV are too low by 73.7 dB for low VHF, by 62.8 dB for high VHF, and by 57.6 dB for UHF. To achieve the field strengths that EchoStar apparently believes are necessary for DTV service, television stations, in order to replicate their Grade B coverage areas, would need to be broadcasting with more than 23 million times the power than they are permitted now in the low VHF band, more than 1.9 million times the power than they are permitted now in the high VHF band, and more than 575,000 times the power than they are permitted now in the UHF

band. The absurdity of these proposals is self-apparent. It is no wonder that EchoStar did not tally the results of its kitchen-sink approach.

EchoStar's wholly fanciful digital signal strength standards are reminiscent of similar outlandish adjustments to the Grade B planning factors that EchoStar (and also the Satellite Broadcasting and Communications Association) proposed five years ago in ET Docket No. 00-90.[8] Just as the Commission did five years ago in the analog context,[9] it should reject EchoStar's "adjustments" to the DTV planning factors which form the basis for the entire digital television transition.

EchoStar's various "adjustments" are discussed below.

Indoor Antenna Penalty and Building Penetration Loss. EchoStar claims that indoor antennas have far less gain than outdoor antennas and suggests that the DTV planning factors need to be adjusted for this disadvantage.[10] EchoStar cites earlier studies that purport to establish that the indoor antenna penalty is approximately 8 dB in the low VHF band, 10 dB in the high VHF band, and 9 dB in the UHF band.[11] EchoStar further points out that indoor antennas suffer not only from

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[8] *See* EchoStar Satellite Corporation Comments, ET Docket No. 00-90, at 17 (proposing that the median field intensity for Grade B should be 66 dBu for low VHF, 77 dBu for high VHF, and 84 dBu for UHF). *See also* Satellite Broadcasting and Communications Association Comments, ET Docket No. 00-90, at 3 (proposing that the median field intensity for Grade B should be 70.5 dBu for low VHF, 76.5 dBu for high VHF, and 92.75 dBu for UHF).

[9] *See Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, Report, 15 FCC Rcd 24321 (2000).

[10] *See* EchoStar Comments, Engineering Statement of Hammett & Edison (hereinafter "Hammett & Edison Statement"), at 3.

[11] *See* Hammett & Edison Statement at 4.

having less gain but are also subject to weaker signals due to attenuation from building penetration.[12] EchoStar suggests that building penetration losses may range as high as 25 dB to 30 dB in the VHF bands and 21 dB to 26 dB in the UHF band in cities such as New York.[13] Although there are certainly indoor antennas that do not suffer nearly the disadvantage EchoStar claims (for example, the Zenith Silver Sensor has an average gain of approximately 4 dB and, being indoors, also does not have up to a 4 dB line loss) and although EchoStar itself points to building penetration loss data that is on the order of 10 dB lower, it is not necessary to either accept or challenge EchoStar's data on these points, for EchoStar's claims with respect to indoor antennas and building penetration losses are simply irrelevant. The Commission has always assumed that homeowners would employ an *outdoor*, directional gain antenna for over-the-air reception of television signals. The *Notice* states that the DTV planning factors "presume that households will exert similar efforts to receive DTV broadcast stations as they have always been expected to exert to receive NTSC analog TV signals."[14] OET 69 states that the planning factors are "assumed to characterize the equipment, including antenna systems, used for home reception."[15] And even EchoStar itself concedes that the digital signal strength standards "are predicated on the use of an *outdoor* antenna."[16] In short, EchoStar has provided no justifiable grounds to overturn an essential element that characterizes the digital replication and transition schemes. This attempt to rewrite the Commission's digital standards is particularly egregious in light of the necessity to locate a Dish Network satellite dish

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[12] *See* Hammett & Edison Statement at 13.

[13] *See* Hammett & Edison Statement at 13.

[14] *Notice* at ¶ 6.

[15] OET 69 at 3.

[16] Hammett & Edison Statement at 3 (emphasis added).

outdoors.

99% Time Probability. EchoStar's attempt to increase time probability to 99% from 90% is deeply flawed. EchoStar asserts that it takes an additional 4.7 dB to achieve F(50,99) at Channel 12 in the high VHF band and 17.5 dB at Channel 41 in the UHF band.[17] These adjustments are said to be derived from data collected at Hammett & Edison's offices. But neither EchoStar nor Hammett & Edison gives any information about how these data were purportedly collected. Significantly, Hammett & Edison claims that it collected data on "fourteen DTV signals that could be received at its Sonoma, California, offices," yet it only provides data for six of those signals.[18] What happened to the data from the other eight stations? Why was it excluded from public dissemination?

EchoStar's claim that 90% time reliability means that a viewer will not receive a digital picture for 36.5 days a year is nonsensical.[19] The statistical nature of the probability function means that any dips below the digital signal strength threshold will be randomly spaced over very long time periods. It has no meaning in the sense of a consecutive time period. EchoStar's assertion is akin to saying that if the weather forecast calls for a 10% chance of rain tomorrow, then it will rain for 2 hours 24 minutes tomorrow and it won't rain for the remaining 21 hours 36 minutes. Obviously, that is not what the weather forecast or the probability of rain means at all.

Finally, and most importantly, the entire DTV replication and transition scheme is predicated

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[17] *See* Hammett & Edison Statement at 7.

[18] *Compare* Hammett & Edison Statement at 6 (stating that data was collected on 14 DTV signals) *with id.* at Figures 1A-1C (exhibiting data on 6 DTV signals).

[19] *See* Hammett & Edison Statement at 7.

upon F(50,90) service. This is clear in the DTV proceedings[20] and in OET 69[21] and is expressly acknowledged by EchoStar.[22] Moreover, F(50,90) is currently being used for DTV spectrum repacking and maximization. Not only would it be grossly unfair to change the statistical nature of digital television service in the seventh inning, but such a change to 99% time probability would greatly shrink local service areas and, therefore, would be directly contrary to SHVERA's purpose to preserve and promote localism and to the requirement that compulsory licenses be construed narrowly, not expansively.[23]

Man-Made Noise. EchoStar claims, relying on an NTIA report, that man-made noise is typically 20 dB and, in urban areas, is typically 30 dB near 54 MHz (Channel 2). EchoStar further speculates that "[t]he increasing use of electrical and electronic equipment in the U.S. suggests that current noise levels could become much greater."[24] EchoStar has misrepresented what the NTIA report says. Rather, the NTIA report cited by EchoStar found man-made noise at 137 MHz, which is between the low VHF and high VHF bands, to be 17.5 dB in business areas and *only 3.6 dB in residential areas*.[25] At UHF frequencies (402.5 MHz and 761 MHz), it was not possible to differentiate man-made noise from system noise, showing that man-made noise is insignificant in

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[20] *See, e.g.*, *Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, Sixth Report and Order, 12 FCC Rcd 14588 (1997) ("*Sixth DTV Report and Order*"), at Appendix A & Appendix B.

[21] *See* OET 69 at 2.

[22] *See* Hammett & Edison Statement at 7 (stating that the "F(50,90) statistical reliability is stated in the FCC planning factors for DTV").

[23] *See* Network Affiliates Comments at 2-13.

[24] Hammett & Edison Statement at 10.

[25] *See* R.J. Achatz & R.A. Dalke, *Man-Made Noise Power Measurements at VHF and UHF Frequencies*, NTIA Report 02-390 (Dec. 2001), at 25.

the UHF band.[26] An earlier 1998 NTIA report found that "residential F_{am} [man-made noise] has *decreased dramatically*."[27] Therefore, contrary to EchoStar's assertions, man-made noise is not becoming greater, and is certainly not becoming greater than 30 dB or even 20 dB, but, instead, man-made noise is actually *decreasing* in residential areas, amounting to no more than 3 or 4 dB at VHF frequencies, and is insignificant at UHF frequencies. Of course, it is in residential areas where people live.

EchoStar notes that the DTV planning factors include a system noise figure of 10 dB at VHF frequencies, which is comprised of 5 dB for receiver noise and 5 dB for environmental noise.[28] The 2001 NTIA report shows that man-made noise at VHF frequencies is within the planning margin (as it also is at UHF frequencies).

Moreover, even EchoStar concedes that "[l]ow-band VHF stations will probably represent a small fraction of all DTV stations."[29] In fact, only 26 stations affiliated with one of the Big 4 networks have been given a DTV tentative channel designation in the low VHF band.[30] EchoStar's concern appears to be that some of these very few stations "may include large rural land areas,"[31] but those are precisely the situations in which the stations are likely to utilize translator and booster

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[26] *See id.*

[27] R.J. Achatz *et al.*, *Man-Made Noise in the 136 to 138-MHz VHF Meteorological Satellite Band*, NTIA Report 98-355 (Sept. 1998), at 31 (emphasis added).

[28] *See* Hammett & Edison Statement at 10 n.28.

[29] Hammett & Edison Statement at 10.

[30] This analysis is based on the DTV tentative channel designations released by the Commission on June 23, 2005. *See DTV Tentative Channel Designations for 1,554 Stations Participating in the First Round of DTV Channel Elections*, Public Notice, DA 05-1743 (June 23, 2005).

[31] Hammett & Edison Statement at 10.

stations to augment their service coverage.

In sum, EchoStar provides no evidence to adjust the digital signal strength standards, even for low VHF, due to man-made noise. Just as the Commission had done in 2000 for analog, it should not recommend any revision to the DTV planning factors based on environmental noise.[32]

White Noise Enhancement, Impedance Mismatch, and Receiver Sensitivity. Unlike the indoor antenna penalty, building penetration loss, 99% time probability, and man-made noise adjustments to the digital signal strength standards that EchoStar appears to propose—each of which it is inappropriate to consider, as shown above—EchoStar raises concerns about white noise enhancement, impedance mismatch, and receiver sensitivity that do have legitimate relevance to whether good DTV reception is possible with the digital signal strength standards set forth in Section 73.622(e)(1). Although the concerns are legitimate, EchoStar's adjustments for these factors tend to lie on the high side but, more importantly, fit within the "safety margin" that already exists in the current planning factors given real-world reception conditions and equipment.

White noise enhancement is the additional noise created in the DTV receiver when the equalizer compensates for multipath ghosts. EchoStar notes that at a "good" receiver location, the white noise enhancement necessary to handle multipath is "less than 0.5 dB," but, "at a poor location, the white noise penalty may exceed 2 dB."[33] However, there is no reason to assume that even a majority of the locations are "poor." A more typical value for moderate multipath conditions with moderate ghosts is around 1 dB. Just as the Commission should not assume the need for a time

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[32] *See Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, Report, 15 FCC Rcd 24321 (2000), at ¶ 52.

[33] Hammett & Edison Statement at 9.

probability of 99%, it should not assume the need for substantial white noise enhancement.

EchoStar presents data that it claims show that the typical DTV receiver is 2.6 dB less sensitive than assumed by the DTV planning factors.[34] However, of the four consumer receivers apparently tested, one, the RCA DTC100, is clearly an older model of either the first or second generation. The other three are either third or fourth generation receivers. None of them was a current fifth generation receiver. The sensitivity of the older model was noticeably worse than that of the other three. Excluding the early generation receiver, then, the average sensitivity, according to EchoStar's own data, is only about 1.7 dB less than assumed by the DTV planning factors, not 2.6 dB. It is believed that the sensitivity of fifth generation receivers nearly matches that assumed by the planning factors.

It is true that the DTV planning factors do not account for impedance mismatch between the antenna and the receiver front end. EchoStar claims that the Voltage Standing Wave Ratio (VSWR) exceeds 2:1 over the bandwidth of consumer antennas, resulting in an impedance mismatch loss of 3 dB.[35] This claim, however, is not based on empirical studies of consumer equipment. One study, which, unfortunately, did not fully present its results, did conclude as follows:

> The results of the tests conducted on the professional-grade antennas show that it is technically possible for antennas to have low return loss and mismatch loss. It is, therefore, reasonable to conclude that consumer-grade antennas with good impedance matching capabilities are feasible. Such antennas would help deliver full coverage to DTV stations.[36]

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[34] *See* Hammett & Edison Statement at 13.

[35] *See* Hammett & Edison Statement at 11-12.

[36] D. Schnelle & R.E. Wetmore, *Evaluation of Antenna and Receiver Mismatch Effects on DTV Reception*, 48 IEEE TRANS. ON BROADCASTING 365, 369 (Dec. 2002).

While a 3 dB impedance mismatch loss may be an approximate rule-of-thumb, further study is necessary to determine how accurate it is. It is technically possible that any mismatch could be considerably lower.

In any event, a typical white noise enhancement of 1 dB, an adjustment of 1.7 dB or less for receiver sensitivity not meeting DTV planning assumptions, and an impedance mismatch loss of 3 dB have a cumulative effect of less than 6 dB. As shown extensively in Network Affiliates' opening comments, there is a safety margin of 9 dB for low VHF, 9 dB for high VHF, and 6.6 dB for UHF already built in to the planning factors if a real-world reception installation is assumed with a readily available consumer antenna and LNA.[37] Those safety margins, it must be noted, include only the advantage in system noise figure due to the LNA and not any of the actual gain that the LNA can deliver to the receiver. If the 15 dB to 20 dB additional gain that the LNA provides to the signal is also taken into consideration, then it is plain that the current digital signal strength standards in Section 73.622(e)(1) are far more than adequate to ensure good-quality DTV reception. As Network Affiliates demonstrated in their opening comments, the Commission has previously recognized that LNAs are typical in fringe areas, and the ATSC recommends their use for digital reception.[38]

In sum, as Network Affiliates, NAB, and MSTV all showed in their comments, the DTV planning factors are appropriate for DTV replication and for SHVERA purposes. There is no need to recommend to Congress the alteration of the digital signal strength thresholds set forth in Section 73.622(e)(1) of the Commission's rules. EchoStar has presented no evidence that

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[37] *See* Network Affiliates Comments at 15-33 & Table 2.

[38] *See* Network affiliates Comments at 24-25.

undermines those thresholds or that even serves as a basis to question them.[39]

II. EchoStar's Suggestions That Would Permit Misoriented Antennas Are Without Merit

EchoStar also makes a number of other assertions, each of which would essentially permit the misorientation of antennas, that, while not expressly affecting the digital signal strength standards themselves, would have a negative effect on local network stations by penalizing them for inappropriate factors and, consequently, shrinking their local service areas. None of these assertions has any merit.

First, EchoStar claims that it is uncommon for households to use rotors. Indeed, EchoStar claims that only about 10-15% of households with outdoor antennas also utilize rotors.[40] EchoStar's estimate of rotor use, however, is fully consistent with the fact that, in most markets, the network affiliates are essentially co-located. Because they are essentially co-located, a rotor is not necessary. NAB showed that 83% (112 of 135) of the television markets with a complement of all four of the

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[39] Although it is not clear, EchoStar also appears to suggest that the actual signal strength *measured* during a site test be "adjusted" downward for a variety of reasons. *See* EchoStar Comments at 7-9; Hammett & Edison Statement at 5. If that is what EchoStar is saying, it must be summarily rejected. SHVERA expressly *fixes* the signal strength thresholds set forth "in section 73.622(e)(1) of title 47, Code of Federal Regulations, *as in effect on December 8, 2004*." 47 U.S.C. § 339(a)(2)(D)(vi)(I) (emphasis added).

EchoStar also repeatedly states that, for digital television, "the difference between an acceptable picture and an unacceptable picture is no picture at all." Hammett & Edison Statement at 11; *see also* EchoStar Comments at 2. This is not true. DTV receivers do not fail by exhibiting no picture at all. Instead, momentary dips in signal strength, momentary increases in interference, and momentary instances of multipath, if temporarily too great for the receiver to handle, result in momentary freezing or macro-blocking. This is no different than what a viewer sees with momentary satellite reception failure. *See also* ATI Comments, Attachment B, White Paper, at 2 & Figure 1.

[40] *See* Hammett & Edison Statement at 2.

Big 4 affiliates have essentially co-located transmitter sites.[41] NAB's data and EchoStar's estimate match up almost exactly.

Second, EchoStar claims that 70% of households are predicted to receive signals from stations that do not fall within the half-power beamwidth of the antenna assumed by the planning factors.[42] However, EchoStar did not analyze whether the stations making up this percentage were Big 4 network affiliates and whether they were affiliated with the same network or a different network. Moreover, in fringe areas the angle necessary to encompass all of the network stations broadcasting from the central metropolitan area is likely to be much smaller than 50°. Furthermore, it is not necessary, for purposes of SHVERA, that a household be able to receive every network affiliate from every market that it may be predicted to receive. For example, a household in Montgomery County, Maryland, located in the Washington, D.C., DMA, may also be predicted to receive the Baltimore stations, but, if it points its antenna towards the Washington stations, that is sufficient, and the angle between the Washington stations and the Baltimore stations is irrelevant. Finally, EchoStar's assertion that "most viewers will not be able to receive optimally all available DTV stations without a properly oriented rotatable antenna"[43] only shows that the Commission's assumption that households should and will use a rotor to orient the antenna properly is correct.[44]

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[41] *See* NAB Comments, Engineering Statement of Meintel, Sgrignoli, & Wallace, at ¶ 44.

[42] *See* Hammett & Edison Statement at 3.

[43] Hammett & Edison Statement at 3.

[44] *See Cable Communications Policy Act Rules*, Second Report and Order, FCC 88-128, 64 Rad. Reg. 2d (P & F) 1276 (1988), ¶ 18 (stating that the Commission has always expected and recognized that "persons living in areas located in the outer reaches of the service areas of broadcast stations (for example, at the edge of a predicted Grade B contour) can, and generally do, take relatively simple measures such as installation of an improved roof-top antenna and careful location and orientation of that antenna to enhance their off-the-air reception"); *Improvements to UHF*

(continued...)

The use of a rotor "solves" this purported problem *in toto*.

Third, and finally, EchoStar claims that, during a site measurement test, the test antenna should only be oriented "in the same direction as other antennas in the area, since it can be assumed that those antennas would be oriented toward a direction that provides the best reception overall."[45] EchoStar ignores several obvious problems with this suggestion: neighboring households may have rotors and only be temporarily oriented in their current direction, neighboring households may have antenna installations that have been essentially abandoned, there may be no neighboring households with outdoor antennas, and there is no readily available methodology to determine which direction the neighboring households have oriented their antennas and to translate that into a direction for the test antenna. In addition, the test antenna should be oriented to the strongest signal, which may mean it is oriented to a nearby multipath reflector and not to the bearing of the transmitter site. There is simply no reason to adopt EchoStar's proposal, which constitutes bad engineering practice.

In short, EchoStar's attempts to avoid the use of rotors or to not fully orient an antenna properly are inappropriate and contrary to the Commission's long-standing expectations.

Conclusion

For the foregoing reasons, Network Affiliates respectfully request that the Commission reject EchoStar's purported "adjustments" to the DTV planning factors and EchoStar's other suggestions that would thwart localism and shrink network affiliate service areas. Instead, as set forth in the

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[44](...continued)
Television Reception, Report and Order, 90 F.C.C.2d 1121 (1982), ¶ 50 (advising that "[a]ntennas should be installed by 'probing' for the best receiving location; signal strength can vary significantly over a very short distance; thus, the antenna should be installed at the location that provides good picture quality for the channels desired").

[45] Hammett & Edison Statement at 4-5.

opening comments, Network Affiliates respectfully request that the Commission recommend to Congress (1) that the digital signal strength thresholds set forth in Section 73.622(e)(1) remain the same for purposes of determining whether a household is "unserved" by a digital signal pursuant to 17 U.S.C. § 119(d)(10); (2) that the testing methodology set forth in Section 73.686(d) be modified slightly, as explained therein, so that the procedure may be used for digital signal site tests; and (3) that Congress prescribe a slightly modified ILLR model, as explained therein, to be used after the digital television transition is complete to presumptively determine the eligibility of a household to receive a duplicating distant digital network signal.

Respectfully submitted,

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July 5, 2005

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Technical Standards for Determining Eligibility	)	
For Satellite-Delivered Network Signals Pursuant	)	ET Docket No. 05-182
To the Satellite Home Viewer Extension and	)	
Reauthorization Act	)	
	)	

To: Office of the Secretary
Attn: The Commission

REPLY COMMENTS OF ATI TECHNOLOGIES, INC.

ATI Technologies, Inc. ("ATI"), by its attorneys, hereby submits these Reply Comments in response to the Commission's *Notice of Inquiry* on the above-captioned proceeding. As the industry leader in the design and production of DTV receiver chips, ATI submitted Comments explaining, among other things, how the performance of DTV receivers has improved dramatically in recent years, as demonstrated by both A/74 Field Ensemble vector testing and in the "real world" by manufacturers conducting their own field tests. ATI noted that, in the second half of 2004, the vast majority of ATI's customers adopted the advanced technology found in "Receiver D" – a fifth generation VSB demodulator – and that products containing this improved technology are only now beginning to be shipped to retailers. Furthermore, based on historical price reductions and anticipated manufacturing volumes, ATI projected in its Comments that the latest generation of high performance VSB demodulators will be available in 2006 for less than the current price for the lower performance VSB demodulators found in the DTV receiver market today.

After reviewing the Comments in this proceeding, ATI is compelled to file these brief Reply Comments responding to the Comments of EchoStar Satellite Corporation ("EchoStar"). EchoStar's Comments urge the Commission to alter its DTV signal strength standard and other rules to account for the alleged failure of the television manufacturing industry to produce a product capable of receiving terrestrial DTV signals as and when anticipated by the FCC's rules. The Commission should decline EchoStar's invitation to rewrite its rules.

EchoStar based its arguments solely on its consulting engineers' observations of the performance of DTV receivers. The observations do not appear to have conformed to the A/74 Recommended Practice nor to the procedures used by ATI and other chip manufacturers. Importantly, the EchoStar observations also do not appear to have been as robust and thorough as the extensive laboratory and field evaluations conducted by original equipment manufacturers who rely on their proprietary tests to design DTV receivers, select the components such as VSB demodulators to use in their devices, and assess the performance of their products and those of their competitors. The Commission should not base its report to Congress or revise its rules based on observations that are inconsistent with the standards and practices of the industry.

Furthermore, EchoStar conducted its observations of DTV receiver performance with equipment containing prior (and therefore inferior) generations of VSB demodulators. Because the OEMs only transitioned in mass to the current generation of chipsets in the second half of 2004, the DTV receivers available to the public (and thus EchoStar's engineers) as recently as May 2005 almost certainly did not include the latest technology. It is not surprising, then, that the DTV receivers observed by EchoStar suffered from the very shortcomings that the fifth generation of VSB demodulator was designed to resolve.

If the Commission elects to conduct its own field tests, it should evaluate DTV receivers containing fifth generation VSB demodulators. ATI projects that a majority of DTV sets and cable set-top boxes reaching the market as soon as this summer, and the overwhelming majority of such devices reaching the market in 2006, will include this latest technology. Any measurement of DTV receiver performance must be conducted with the specifications that very soon will be standard across virtually all manufacturers.

ATI recognizes that DTV receivers in homes today include prior generations of VSB demodulators. Consumers who paid thousands of dollars for DTV sets over the past few years, however, are much more likely to receive television programming via cable and DBS services than over-the-air reception. Cable and DBS providers currently are upgrading their set-top boxes to MPEG-4 and other new technologies, and these new set-top boxes overwhelmingly will include fifth generation VSB demodulators. Early adopters, therefore, will also begin benefiting from the improved performance of the fifth generation VSB demodulators as they replace their set-top boxes. In other words, the number of consumers relying solely on prior generations of VSB demodulators will decrease at the same time that consumers acquiring new DTV receivers overwhelmingly will obtain equipment containing fifth generation VSB demodulators. The current universe of consumers relying on prior generations of DTV receiver technology soon will begin shrinking, thereby making any new Commission rules based on the outdated technology increasingly irrelevant with each passing month.

Conclusion

The newest DTV receiver technology will permeate the entire marketplace rapidly over the next several months. As a result, it would be unreasonable at best for the Commission to craft any DTV receiver prediction model or measurement standard based upon EchoStar's observations of outdated and disappearing technology, even if such observations had been conducted consistent with industry practices.

Respectfully submitted,

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Dated: July 5, 2005

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Technical Standards for Determining	)	ET Docket No. 05-182
Eligibility for Satellite-Delivered Network	)	
Signals Pursuant to the Satellite Home	)	
Viewer Extension and Reauthorization Act	)	

Reply Comments of
Cohen, Dippell and Everist, P.C.

These Reply Comments are submitted on behalf of Cohen, Dippell and Everist, P.C. ("CDE") to the Notice of Inquiry in ET Docket No. 05-182. The Federal Communications Commission ("Commission"), in this proceeding, began the process to determine the availability of digital signal strength standard and testing procedures. This procedure would be used to determine the presence or absence of an appropriate DTV signal at a household that may be eligible to receive distant broadcast network signals from satellite communications providers. CDE has reviewed the various comments that were filed at the Commission.

The purpose of the docket is to have the Commission study whether any statutes and regulations should be revisited to respond to the provisions of Section 204(*b*) of the Satellite Home Viewers Extension and Reauthorization Act of 2004 ("SHVERA").

Background

As discussed in the Notice of Inquiry in 1988, Congress adopted the Satellite Home Viewer Act ("SHVA") as an amendment to the Copyright Act. Under SHVA, the Commission sought a

balance to protect broadcasters' programming interests while permitting households that were not regularly served by local stations to be provided broadcast programming via a satellite provider. Subsequently, in 1999 Congress revised the prior statute by adding Section 339(c)(3) to the Communications Act of 1934. It basically required the Commission to reconsider and develop a point-to-point predictive model. In late 2000, the Commission issued its Report to Congress recommending that the Grade B signal intensity standard and eight of the nine (9) planning factors be retained as a basis of household eligibility. In addition, in late 2000 the Commission indicated that it was premature to construct a similar methodology for eligibility for distant DTV signals.

Discussion

In the Notice of Inquiry, the Commission requested information on:

- receive antenna placement and whether fixed or rotatable
- whether Section 73.686(d) be amended to create a different procedure for DTV signal is present than for the present NTSC methodology.
- presence of certain signal strength using antennas of reasonable cost and installation
- whether to develop a predictive methodology to determine that a household is unserved
- whether there is a wide variation in the ability of consumer grade sets to display a high-quality picture
- whether to include factors such as building loss, external interference source or undesired signal from digital and analog stations, foliage and man-made clutter

The joint comments of ABC, CBS and NBC[1], comments of the Association of Maximum Service Television, Inc.[2] and comments of the National Association of Broadcasters[3] are noteworthy.

These comments are useful in responding to the Commission's request for information and are supported, particularly the joint network comments containing the statement of Jules Cohen, P.E. However, it is the opinion of this firm that it is premature to develop any criteria based on available data. The 1988 (SHVA) and 1999 (basis of SHVVA) amendments to the Copyright Act and the 1934 Communications Act were developed on a historical mountain of data accumulated over more than 30 years. To date, that same reservoir of data is not available in which to make this assessment for DTV. To this end, the Commission should make available its DTV measurement data collected in the Washington, D.C. area. This would help to ascertain the areas in which the focus of this Notice of Inquiry should take place. Further, it is to be recognized that the broadcast industry is in transition to implement DTV and therefore a period of buildout will continue. This is readily apparent from the dates imposed by Report and Order, MM Docket No. 03-15.[4] Therefore, a realistic and useable assessment of the DTV service to be studied cannot be made until the buildout and data collection are

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[1]Comments of the ABC, CBS, and NBC Television Affiliate Associations

[2]Comments of the Association for Maximum Service Television, Inc.

[3]Comments of the National Association of Broadcasters

[4]In the Matter of Negotiated Channel Election Arrangements, Second Periodic Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, MM Docket No. 03-15, RM 9832, adopted June 3, 2005 and released June 8, 2005.

studied cannot be made until the buildout and data collection are completed. Many factors have hampered this buildout including environmental, terrorist, and international coordination issues.

Therefore, lacking the final disposition of the DTV facilities and the necessary data impose an uncertainty into the process and thereby this proceeding.

It is mission critical that any such task be based on reliable and sensible data. The data describing the station's technical parameters should reflect that actual station's DTV facilities. For example, the data requested in the DTV form to describe a directional pattern and the actual pattern printout can result in errors up to 10 dB. Further, the current database does not take accurately into account when a station specifies a combined electrical and mechanical tilt is used. Nor does the current database accurately take into account the actual elevation pattern. These factors also can lead to incorrect results in any predictive model. Therefore, such routine parameters in this process need to be revisited in order to yield a meaningful predictive method.

Respectfully Submitted,

Donald G. Everist
President
DC PE No. 5714

Date: July 5, 2005

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
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Pursuant To the Satellite Home Viewer	)	
Extension and Reauthorization Act	)	
Reauthorization Act of 2004	)	

REPLY COMMENTS OF ECHOSTAR SATELLITE L.L.C.

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July 5, 2005

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REPLY COMMENTS OF ECHOSTAR SATELLITE L.L.C.

EchoStar Satellite L.L.C. ("EchoStar") hereby submits its reply comments on the Notice of Inquiry released by the Commission on May 3, 2005 ("NOI"). The NOI sought comment on the adequacy of the digital signal strength standard and testing procedures used to determine whether households are eligible to receive distant digital television ("DTV") network signals from satellite carriers.[1]

EchoStar urges the Commission to reject the often counter-intuitive submissions of broadcaster interests that would reduce the accuracy of digital signal strength testing and/or future predictive models in determining whether a consumer can actually receive a good quality digital picture over-the-air at his or her location using readily available consumer equipment. Such rules would doom millions of subscribers to inadequate DTV reception and delay the DTV transition that Congress has done so much to foster. If the DTV transition nonetheless proceeds,

[1] *Technical Standards for Determining Eligibility For Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Extension and Reauthorization Act*, FCC 05-94, Notice of Inquiry, ET Docket No. 05-182 (rel. May 3, 2005), published 70 Fed. Reg. 28503 (2005) ("NOI").

such proposals could mean that millions are left behind, without *any* high definition signal from one or more networks.

In addition, because the scope of the distant digital signal license is not the subject of this inquiry, the Commission should resist making premature pronouncements about the meaning of the statutory copyright license provisions, despite broadcasters' extensive submissions on this topic, and should focus instead on its statutory mandate to consider improvements to the digital signal strength standard and testing procedures. Finally, the Commission should dismiss, for being completely irrelevant to this proceeding, the gratuitous attacks made by broadcasters against the integrity of the Direct Broadcast Satellite ("DBS") industry.

I. THE COMMISSION SHOULD AVOID MAKING INTERPRETATIONS ABOUT THE SCOPE OF THE DISTANT DIGITAL LICENSE THAT ARE IRRELEVANT TO THIS PROCEEDING

As an initial matter, EchoStar notes that the National Association of Broadcasters ("NAB") and the ABC, CBS, and NBC Television Affiliate Associations ("Network Affiliates") devote many pages in their comments to setting out their interpretation of the general scope of the statutory license for distant digital signals, pointing to new limitations on the carriage of such signals introduced by the Satellite Home Viewer Extension and Reauthorization Act of 2004 ("SHVERA").[2] No doubt, the broadcasters would like the Commission to endorse its view of those provisions.

This inquiry, however, is not about the general scope of the distant digital signal license. Instead, this is "an inquiry regarding whether, for purposes of identifying if a household

[2] Comments of National Association of Broadcasters at 1-13, *filed in* MB Docket No. 05-182 (filed Jun. 17, 2005) ("NAB Comments"); Comments of the ABC, CBS, and NBC Television Affiliate Associations at 1-13, *filed in* MB Docket No. 05-182 (filed Jun. 17, 2005) ("Network Affiliates' Comments").

is unserved by an adequate digital signal under [17 U.S.C. § 119(d)(10)], the digital signal strength standard in [47 C.F.R. § 73.622(e)(1)], or the testing procedures in [47 C.F.R. § 73.686(d)], such statutes or regulations should be revised" to take into account various statutory factors affecting signal strength and reception.[3] To this end, the Commission is required to deliver a report to Congress with its recommendations for changes to the digital signal strength standard or testing procedures, including a recommendation on whether to use a predictive model to determine whether a household is "unserved."[4] This inquiry has nothing else to do with the digital signal license.

Accordingly, the broadcasters' extensive submissions in this regard are irrelevant and the Commission should resist making premature pronouncements about the meaning of the statutory license provisions beyond the scope of the inquiry mandated by Congress. Otherwise, the Commission risks making interpretive rulings in the abstract that parties may later claim were definitive and worthy of deference. Even more important, the Commission is not charged with enforcing the copyright laws. The courts, and not the Commission, are tasked with adjudicating disputes over the scope of 17 U.S.C. § 119.

II. THE COMMISSION SHOULD RECOMMEND CHANGES TO THE DIGITAL SIGNAL STRENGTH STANDARD, TESTING PROCEDURES AND FUTURE PREDICTIVE MODELS THAT WOULD IMPROVE, NOT WORSEN, THEIR ACCURACY IN DETERMINING WHETHER A HOUSEHOLD IS "UNSERVED"

Whether a household is unserved by a digital over-the-air signal should be measured against the consumer's ability to receive a good quality picture in the location in which he or she resides using readily available consumer equipment. The adequacy and accuracy of the

[3] *See* 47 U.S.C. §§ 339(c)(1)(A) and (B).

[4] *See* 47 U.S.C. §§ 339(c)(1)(B)(iv) and 339(c)(1)(C).

digital signal standards, the testing procedures, and future predictive models should be judged against this standard.

As EchoStar has pointed out, digital television ("DTV") reception problems can result not only in degraded picture quality but, more often than with analog reception, can also result in the consumer not being able to receive a picture at all.[5] Consequently, it is important to ensure that the digital signal strength standard, the testing procedures, and any predictive model used to determine whether a household is unserved, take into account all factors that affect whether an artifact-free DTV *picture* can actually be received, and not merely whether the DTV *signal* is strong enough at the location in question. Contrary to the broadcasters' suggestion, the fact that Congress chose to limit the availability of distant digital signals in SHVERA does not reduce the need for accuracy in the remaining situations in which it is important to determine when a household is unserved. Indeed, these are the households most at risk during the digital transition -- *i.e.* households in smaller, typically rural, markets that cannot get a local digital signal over-the-air and in which cable service and/or satellite local-into-local service may not be available.

In its comments, EchoStar's engineering experts, Hammett & Edison, Inc. (H&E), have shown why some of the assumptions in the Commission's DTV planning factors appear to have been unrealistic. In a supplemental report (Attachment A), H&E further responds to the accuracy of the assumptions in the DTV planning factors raised by broadcasters ("H&E Reply Statement"). In addition, EchoStar has proposed several changes to the digital strength standard, testing procedures and predictive methodology that would make them more accurate in determining when a household is digitally "unserved," including the use of indoor antennas, the

[5] Comments of EchoStar Satellite L.L.C. at 2, *filed in* MB Docket No. 05-182 (filed Jun. 17, 2005) ("EchoStar Comments").

lack of rotation in many consumer antennas, and the need to take into account time variability in signal strength. In contrast, many of the broadcasters' comments and suggestions would have the opposite effect or impose unreasonable burdens on consumers.

The Broadcasters Ask Consumers to Make Unreasonable Expenditures to Gain Access to an High-Definition Signal. What is squarely *within* the scope of this inquiry is the extraordinary burden that the consumer would have to bear in order to satisfy all the requirements suggested by the broadcasting industry in order to receive a clear over-the-air digital signal. The broadcasters would have consumers purchase an incredible litany of state-of-the-art equipment, each straining further the consumer's budget: the most up-to-date "generation" of DTV receiver in order to reduce (without eliminating) multipath interference problems; a low-noise amplifier ("LNA") to boost DTV reception; Type RG-6 coaxial cable to avoid downlead line loss; separate antennas for VHF and UHF to improve reception; and some external means of switching between the two antennas. The cumulative cost of these items to consumers will be significantly above the cost of an analog-to-digital converter box that the broadcasters are urging Congress to provide as a subsidy for analog viewers. Finally, this enumeration of costs for additional items does not include any fees associated with installing these devices in consumers' homes.

The Commission's Planning Factors Were Intended Primarily For Channel Allotments. It is important to note that the DTV planning factors were developed primarily for a purpose different from that here. As H&E explains, these factors were adopted in part to assign channel allotments, and not for the more granular purpose of concretely ascertaining whether a particular consumer could actually receive a DTV picture at his or her home. Even more important, many of these factors have been overtaken by events.

For example, as H&E points out, the planning factors assume different receiving antenna patterns for analog and DTV reception.[6] The belief underlying that assumption was that consumers would install better-performing antennas for DTV use. In fact, however, events on the ground suggest a more reasonable assumption is that they will not. H&E notes that the specified 28 dBu minimum field strength required for DTV reception at VHF low-band has also been criticized as being inadequate,[7] largely due to inadequate consideration of man-made noise at those channels. Additionally, the planning factors assume that interference from DTV stations operating on other than co- and adjacent-channels would not exist. This assumption was in turn based upon the performance of a dual-conversion prototype DTV receiver. Again, subsequent developments have cast doubt on that assumption. Most of all, consumer DTV receivers today are single-conversion, meaning that they are far more susceptible to interference from so-called "taboo channels."[8]

Now that several generations of consumer DTV receivers are available, it is appropriate for the Commission to draw upon actual experience with this equipment to employ more empirically tested planning factors in this proceeding, since such factors will more accurately reflect the consumer's ability to actually receive a DTV picture.[9]

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[6] See H&E Reply Statement at 5 (citing H&E Petition for Reconsideration in MM Docket No. 87-268, filed June 13, 1997).

[7] *See id*. at 6 (citing Victor Tawil and Charles Einolf, Jr., "Impact of Impulse Noise on DTV Reception at Low VHF," Proc. IEEE Broadcast Technology Symposium, 2004).

[8] *Id*.

[9] In its Comments, EchoStar highlighted the results of an H&E study revealing that the signal sensitivities of the current generation of DTV receivers can be significantly worse than the signal sensitivities assumed in the Commission's planning factors. *See* EchoStar Comments at 4. H&E concluded that the digital strength standard should be revised upward to take into account the reality of DTV receiver sensitivity.

Use of Outdoor Antennas for Testing Would Lead to Many Inaccurate Determinations of When a Household is "Unserved." The NAB essentially concedes that "[i]ndoor antennas perform much less well at receiving over-the-air TV signals"[10] because they have lower gain, are typically located at lower heights than outdoor antennas, are nondirectional, and are prone to dynamic multipath problems that affect reception.[11] Counter-intuitively, however, the NAB's proposed solution is to continue digital signal strength testing using properly pointed roof-top antennas.[12] This would virtually guarantee an inaccurate determination of whether a household is unserved for the many (*e.g.* apartment dwellers) that cannot practically install directional rooftop antennas.

The fact that the Commission's DTV planning factors assume the use of rooftop antennas, raised by NAB as a justification for its position, is beside the point. The pertinent question here is not broadcasters' service area requirements. It is a simple and concrete inquiry: whether the consumer in question can actually receive a good quality digital picture over-the-air. Accordingly, the Commission should utilize actual, empirically-based planning factors in this proceeding, including use of indoor antennas. Equally unavailing is NAB's assertion that the viewers in question will also be utilizing a satellite dish, which is typically installed outdoors.[13] The fact that such residents will also need a properly pointed satellite dish does not justify use of outdoor antennas for testing. DBS antennas are typically smaller and need only be pointed in one direction, whereas outdoor DTV antennas typically require substantially more space and

[10] NAB Comments at 16-17.

[11] *Id*. at 17.

[12] *Id*. at 16; *see also* Network Affiliates Comments at 34.

[13] *See* NAB Comments at 18.

may need to be rotated to adequately capture different over-the-air stations. As a result, a DBS antenna is practicable in many settings where a rooftop DTV antenna is not.

The Use of Directional Gain Antennas for Testing Has Already Been Correctly Rejected by the Commission. The Network Affiliates suggest that tests be conducted using a directional gain antenna as opposed to a half-wave dipole antenna.[14] This, they say, would "ameliorate any difficulties that could be caused by multipath at the site."[15] This suggestion is misguided, would likely lead to inaccurate results in determining whether a household is "unserved," and has for these reasons already been rejected by the Commission in the analog context. Directional gain antennas are not representative of most indoor antennas.

Moreover, directional gain antennas are more difficult to calibrate and are more easily damaged (leading to an uncalibrated condition). They are also more expensive. These shortcomings have already led the Commission to reject use of directional gain antennas for signal measurement under the Satellite Home Viewer Act:

> Regarding the preparation for measurements, we considered the kind of testing antenna that should be used and conclude that a tuned half-wave dipole is the best choice. It is widely available, inexpensive, and simple to use. In situations where definite readings are required, it has advantages over gain antennas that are difficult to characterize (calibrate) over a wide range of frequencies. Although dipole antennas are susceptible to interference from signals other than the one being measured, the cluster measurements that we require will mitigate those effects.[16]

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[14] Network Affiliates Comments at 38.

[15] *Id*.

[16] *See Satellite Delivery of Network Signals to Unserved Households for Purposes of the Satellite Home Viewer Act; Part 73 Definition and Measurement of Signals of Grade B Intensity*, 14 FCC Rcd 2654, at ¶ 51 (1999) (citations omitted).

"Fifth-Generation" And Later Receivers Are Not a Panacea for Dealing With Multipath Interference. The Network Affiliates' candid admission that there may be multipath problems sits uneasily with their position that "multipath should not be taken into account in determining whether a household is served by an adequate digital signal."[17] To arrive at this cavalier disregard of the problem, the Network Affiliates note that "fifth generation" or the "latest" receivers can deal with more types of multipath. The Commission should resist adopting that position. While the latest receiver designs do appear to have improved abilities to receive digital signals in the presence of certain types of multipath over prior generations, they do not represent a panacea. As H&E explains, the white noise enhancement penalty associated with the operation of the equalizer in the DTV receiver still remains and must be considered.[18] The presence of multipath at a receiving site effectively reduces the available strength of the DTV signal at that site because the equalizer in the receiver generates noise in proportion to the degree of multipath.[19] For example, if there is 3 dB of white noise enhancement, then a receiver that had a 15.2 dB noise threshold under ideal conditions (*i.e.*, no multipath) will have a 18.2 dB noise threshold under the multipath condition. This 3 dB increase in noise is equivalent to a halving of the transmitter power of the DTV station. The NAB presents data[20] showing that fifth generation receiver performance under some static multipath conditions requires 3–4 dB of additional signal to overcome the white noise penalty. Since white noise enhancement can be substantial at sites having severe multipath, it is important that this parameter be measured and subtracted from the nominal measured field strength in any field test.

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[17] Network Affiliates Comments at 37.

[18] H&E Reply Statement at 4.

[19] *Id*.

[20] NAB Comments at 41, Table 12.

Equally importantly, H&E explains that fifth generation designs generally have failed to address difficulties associated with producing a usable DTV picture under dynamic (as opposed to static) multipath conditions, which may account for the continuing failure to receive about 10% of signals under empirical conditions.[21] And H&E notes that improvements in the performance of the fifth-generation demodulators do nothing to improve the performance of other components in the DTV receiver. Specifically, the performance of the tuners in consumer DTV receivers has been criticized as limiting DTV reception in the presence of otherwise adequate signal levels.[22] While these DTV tuner problems are largely associated with the presence of strong interfering signals, there may be impacts at many locations on consumer reception of network signals, which will not be resolved by use of fifth generation receivers.

Finally, the Commission should keep in mind that consumers generally have no knowledge of what "generation" DTV receiver they are purchasing. The "generational" concept is one employed by consumer electronics manufacturers, and is not something publicized to consumers at large. Indeed, even engineering experts at times have difficulty ascertaining what "generation" a receiver might be, and manufacturers are not necessarily willing to supply such information.[23] Thus, consumers may be expected to seek the product having the lowest cost. They may often do so even if provided with detailed information concerning the performance characteristics of that product. For all of these reasons, the Commission should not rely upon the roll-out of fifth generation and later receivers as a substitute for coming to grips with known difficulties such as multipath.

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[21] H&E Reply Statement at 5 (citing Tim Laud, *et al*., "Performance of 5th Generation 8-VSB Receivers," IEEE Trans. Consumer Electronics, Vol. 50, No. 4, November 2004).

[22] *Id*. (citing Charles W. Rhodes, "Interference Between Television Signals Due to Intermodulation in Receiver Front-ends," Proc. IEEE Broadcast Technology Symposium, 2004).

[23] *See id*.

The Commission Should Take Into Account the DTV Signal's Time Variability. As EchoStar explained in its Comments in this proceeding, the Commission should bear in mind that field measurements are no more than a "snapshot" of typical reception conditions and thus, are inadequate to ensure long-term reliability of DTV reception.[24] While DTV service is to have at least 90% reliability over time, a single a single set of cluster measurements cannot adequately characterize the time variability to provide reasonable assurance that the DTV signal will be available 90% of the time. Therefore, some additional action, such as applying a correction factor, must be done. This issue appears to have garnered little, if any, comment from other participants in this proceeding.

Given that the FCC's criterion for DTV coverage is a specified threshold field strength with 50% confidence, 90% of the time, that is, a situational variability factor of 50% and a time variability factor of 90%, commonly written as F(50,90), a 90% time (or greater) reliability factor should be applied to the assumed median value obtained during the cluster measurements to adjust the assumed "typical" measured field strength to a 90% time value.[25]

The Commission Should Not Assume That All Consumers Have Low-Noise Amplifiers. The broadcasters also suggest that it is reasonable to assume that consumers use low-noise amplifiers ("LNAs") mounted near their rooftop antennas to boost DTV reception.[26] This is a wholly unrealistic assumption for a number of reasons. First, most LNAs, however, are not suitable for use with indoor antennas.[27] Moreover, encouraging broader use of LNAs can

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[24] *See* EchoStar Comments at 8-9.

[25] *See* H&E Reply Statement at 6.

[26] NAB Comments at 22-23; Network Affiliates' Comments at 23-27.

[27] Low-noise amplifiers installed indoors are often ineffective because of the high radio frequency noise levels encountered in such environments. *See* http://www.tvantenna.com/support/tutorials/uhf.html (Presented by The National Association of

create serious unintended consequences. LNAs can make receiving installations prone to "overload" problems. That is, a strong nearby station (such as an FM broadcast station or amateur radio station) can overload the LNA, such that it does not function for reception of DTV signals. There is also a history of aging-related problems associated with LNAs, such that broader use should not be encouraged. Because they are installed outdoors and subject to many hot/cold cycles over time, many LNAs become unstable and self-oscillate -- basically becoming transmitters -- causing interference to various services, including public safety.[28] The FCC thus could create a significant new enforcement burden for itself by encouraging widespread consumer use of LNAs. Accordingly, tests should not be conducted using LNAs, nor should future predictive models for DTV reception assume that such amplifiers have been installed.

Land Cover and Land Clutter Values Should be Included in Predictive Models.

As EchoStar has consistently pointed out, the ILLR does not, in fact, incorporate realistic values for land use and land clutter. This fact is borne out by a comparison between measured and predicted (using Longley-Rice) signal strengths conducted and reported by Anita Longley*, et al*. of the Institute for Telecommunications Sciences. As H&E explains, Ms. Longley reports that there are many cases when the results of the predictive model do not agree with the field measurements: "Some of the differences between predicted and measured median values may be caused by terrain clutter, such as buildings and trees, which has not yet been included in the

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Broadcasters, PBS, and Stallions Satellite and Antenna) ("This [preamplifier] unit should be mounted on the antenna mast about a foot below the main boom of the antenna...") *and* Network Affiliates Comments at Exhibit 1 (Antennacraft Pre-amplifiers are designed to be "mast-mounted;" Blonder-Tongue preamplifiers are designed to "mount on a 1.5 inch O.D. (max) antenna mast....").

[28] *See* Robert D. Weller, "Radio Frequency Interference from Non-Licensed Devices," RF Design, August 1992 (noting that about 6,800 reports of interference from non-licensed devices were found in the FCC's Case Management System database over the period October 1989-February 1992. A number of these reports were ultimately traced to radiating television pre-amplifiers).

prediction models."[29] Ms. Longley later added: "The [Longley-Rice] propagation model calculates transmission loss, with allowances for radio frequency, terrain irregularity, path length, and antenna elevation. Most of the data previously considered [in developing the model] were from open areas, towns and small cities. To this model, we can now add an allowance for the additional attenuation due to urban clutter…."[30] She then described a method for incorporating the effects of clutter, but this method is not incorporated into version 1.2.2 of the ITS Irregular Terrain Model, which underpins ILLR.

H&E observes that while it is possible that some of the data sets used in the development of the Longley-Rice model unavoidably contained clutter, clearly most did not, and the type or degree of such clutter, when present, was not systematically collected or included in the model. Even the Hufford paper cited by the Network Affiliates acknowledges this: "It should then be noted that these data [for the model] were obtained from measurements made with fairly clear foregrounds … [i]n general, ground cover was sparse . . . ,"[31] which suggests careful site selection to minimize interference from clutter.[32] Indeed, Hufford advises users to "make suitable extra allowances or additions" when employing the model in "urban conditions" or other heavy land-cover situations.[33]

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[29] H&E Reply Statement at 1-2 (quoting A. G. Longley, "Measured and Predicted Long-Term Distributions of Tropospheric Transmission Loss," OT/TRER Report No. 16, July 1971, at 5) (internal quotation marks omitted).

[30] H&E Reply Statement at 2 (quoting A. G. Longley, "Radio Propagation in Urban Areas," OT Report 78-144, p. 31, April 1978).

[31] G.A. Hufford , "A Guide to the Use of the ITS Irregular Terrain Model in the Area prediction Mode," NTIA report 82-100, p.12, Apr. 1982, *quoted in* Network Affiliates Comments at 45.

[32] H&E Reply Statement at 1.

[33] Hufford, *supra*, at 12.

As every television viewer knows, buildings, trees, and other types of land clutter can interfere with a viewer's receipt of television transmissions. Accordingly, continued failure to account for the effects of land clutter in the ILLR model is simply wrong, and ensures that multitudes of consumers will be consigned to inadequate DTV signal reception.

Downlead Line Losses. The broadcasters attack the Commission's planning factors for downlead line losses as being too "conservative."[34] On the contrary, H&E has discovered a number of deficiencies in the Commission's downlead line loss factors. They lead to the conclusion that, if anything, the factors are inadequate. For example, the Network Affiliates erroneously infer, based upon review of one product from a single manufacturer, that Type RG-6 coaxial cable is subject to particular defined levels of loss lower than the Commission's planning factors.[35] H&E reports that in fact, this is not the case: as there are reports of material variation among the different RG-6 products made by various manufacturers, suggesting that the loss levels can in fact be higher than the planning factors.[36] Moreover, it is not necessarily realistic to assume that most consumers will even use RG-6 cable. Budget-conscious consumers will likely favor a less expensive alternative is available that is subject to even greater losses.[37] Finally, a number of other sources of loss, including "balun loss," "splitter" loss and losses due to "impedance mismatch," are not accounted for at all.[38] It follows that the Commission's planning factor values for downlead line losses, which account only for

[34] Network Affiliates' Comments at 17.

[35] See Network Affiliates' Comments at 17.

[36] See H&E Reply Statement at 2.

[37] *Id*.

[38] *See id*. at 2-3.

cable losses, are inadequate and should be increased. Certainly, H&E's findings demonstrate that there is no basis for reducing downlead line loss factors, as the broadcasters suggest.

Use of Separate VHF and UHF Antennas. In determining the relevant figures for ascertaining the gain of typical consumer antennas, the broadcasters suggest the use of separate VHF and UHF antennas. Although, from a purely technical standpoint, the use of separate antennas for each band can result in improved receiving system performance, H&E reports that the use of separate antennas is atypical and unrealistic. The evidence is that consumers prefer combination antennas.[39] Not only do manufacturers appear to offer more combination antennas than VHF-only or UHF-only (doubtless a reflection of consumer preferences), but the added cost and technical complexities associated with separate antennas also make such a choice an unlikely one for consumers. Moreover, most, if not all, modern television receivers (including many of the most popular DTV receivers) lack the ability to switch between separate VHF and UHF antennas. This necessitates the installation of some external means of switching between the two antennas or combining in order to use separate antennas. This additional equipment adds to the cost and complexity of the receiving installation, and may be beyond the technical capability of some consumers.[40]

III. THE BROADCASTERS' GRATUITOUS ATTACKS ON THE INTEGRITY OF THE DBS INDUSTRY, AND ECHOSTAR IN PARTICULAR, ARE IRRELEVANT TO THIS INQUIRY

As noted above, this inquiry is about whether to make changes to the digital strength standards and testing procedures, and whether to introduce a predictive model, taking into account the statutory criteria spelled out in Section 339(c)(1) of the Communications Act.

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[39] *See id*. at 3-4.

[40] *See id*. at 4.

Accordingly, the Commission should focus on the statutorily mandated inquiry rather than extraneous factors such as the integrity of DBS industry. The broadcasters' gratuitous attacks in this regard are completely irrelevant to the inquiry at hand.

One of these extraneous points needs to be addressed, however. The NAB refers to certain comments by EchoStar's chairman and to comments made during the proposed merger of EchoStar and DTV regarding the relatively small number of local-into-local markets that can be served with high-definition ("HD") local stations and compares them to the 155 local markets in which EchoStar currently provides local-into-local service.[41] The NAB cites this as a reason to be skeptical about EchoStar's claims about how "difficult (or uneconomical) it would be to offer digital local-into-local in a large number of markets."[42] In addition to all the other flaws of the NAB's argument, this evidences a complete failure to understand the substantial differences between the carriage of local stations in standard definition ("SD"), which is what EchoStar currently does with respect to local analog stations, and carriage in HD (which was what Mr. Ergen was talking about in the passage quoted). The economics of providing HD locals is very different from the economics of providing analog locals in SD, in view of the vastly greater bandwidth required to retransmit HD signals. Thus, the fact that EchoStar today offers SD locals service in 155 markets proves nothing whatsoever about the economics of offering HD locals.

In fact, contrary to the NAB's dark intimations, EchoStar has been striving to increase the availability of over-the-air HD broadcasting to consumers. EchoStar's receivers have built-in tuners designed to receive over-the-air broadcast signals and to integrate them with its satellite television service. In fact, H&E reports that the performance of EchoStar's built-in over-the-air tuner compares favorably with the performance of the digital receivers available

[41] NAB Comments at 12 n.14.

[42] *Id*.

today.[43] EchoStar's set-top boxes are also programmed to recognize when a digital signal is being received over the air and to include the program information about these channels in EchoStar's electronic program guide.

IV. CONCLUSION

EchoStar urges the Commission to take the above reply comments and the H&E Reply Statement into account in formulating its report and recommendations to Congress.

Respectfully submitted,

/s/

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July 5, 2005

[43] H&E Reply Statement at 7.

ATTACHMENT A

Reply Statement of Hammett & Edison, Inc.

Consulting Engineers

Before the
Federal Communications Commission
Washington, D.C. 20554

In Re Technical Standards for Determining	)	
Eligibility for Satellite-Delivered Network	)	**ET Docket No. 05-182**
Signals Pursuant to the Satellite Home	)	
Viewer Extension and Reauthorization Act	)	

REPLY COMMENTS OF THE NATIONAL ASSOCIATION OF BROADCASTERS

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July 5, 2005

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The National Association of Broadcasters ("NAB") hereby files its reply comments in response to the Notice of Inquiry ("Notice") released by the Commission on May 3, 2005, in the above-referenced proceeding.[1/]

Introduction and Summary

As NAB explained in its initial comments, Congress' goal in the Satellite Home Viewer Extension and Reauthorization Act ("SHVERA") was to promote *local-to-local* satellite delivery of TV station signals -- both analog and digital -- and to minimize and phase out delivery of *distant* signals by satellite carriers. DIRECTV's plan to offer digital local-to-local service *this year* to 45% of U.S. television households, and by 2007 to deliver as many as 1,500 local digital signals by satellite, is fully consistent with this objective. DIRECTV's Comments confirm that, because of the "if local, no distant" provisions of SHVERA, the distant signal license will become irrelevant to DIRECTV within the next few years. DIRECTV Comments at 1-2.

EchoStar, by contrast, has to date announced few plans for offering digital local-to-local service. Rather, EchoStar appears to be intent on, wherever possible, using national digital feeds (from New York and Los Angeles) as a low-cost substitute for local-to-local service. *See* NAB Comments at 11-12 (quoting EchoStar CEO Charles Ergen on economic advantages of national feeds).

Consistent with this apparent business plan, EchoStar's Comments consist of a litany of technical arguments designed to increase -- massively -- the number of households that will be deemed "unserved" over-the-air by digital signals of network stations. *See* EchoStar Comments at 3-11. EchoStar's technical arguments are self-serving -- and wrong. The Commission should

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1/ NAB is a nonprofit, incorporated association of radio and television broadcast stations that serves and represents the American broadcast industry.

not allow EchoStar to exploit this proceeding to advance a business plan that is contrary to the expressed will of Congress to promote local-to-local service.

A second "lens" through which EchoStar's Comments should be filtered is the double standard it inexplicably proposes to apply to broadcast signals on the one hand, and to its own signals on the other hand. For example:

- EchoStar proposes to treat households as "unserved" over the air unless they can receive local TV stations with an indoor antenna -- even though DBS would be doomed if it were forced to rely on indoor antennas;

- EchoStar insists that if outdoor antennas are used to test over-the-air signals, they be pointed in the wrong direction -- even though mispointing would likewise be fatal for DBS;

- EchoStar asks the Commission to impose extraordinarily high performance standards on broadcasters -- even though DBS service is subject to "rain fade" and is unavailable if anything at all (whether a house or a tree branch) blocks a satellite dish's direct line of sight to the satellite.

A third theme common to virtually all of EchoStar's arguments is that they ignore, and often contradict, the Commission's detailed plans for the analog-to-digital transition. EchoStar's bid to impose a "99% time variability" requirement on broadcasters for purposes of SHVERA, or vastly to increase the minimum field strengths required for a location to be "served," for example, would punish stations for *obeying the Commission's rules governing the transition.* That is, to comply with EchoStar's proposals, stations would need to commit gross violations of the Commission's limits on effective radiated power ("ERP") for digital signals.

The Commission's present task is to prepare a report to Congress about measurement and prediction of digital signal reception. Regulations based on EchoStar's proposals, however,

would both be contrary to the express intent of Congress and arbitrarily depart from the assumptions that underlie the digital transition. The Commission should instead make recommendations to Congress that will promote local-to-local service and discourage abuse of the distant-signal license.

I. TESTING BASED ON INDOOR ANTENNAS WOULD BE ARBITRARY AND CAPRICIOUS

EchoStar argues that site testing of digital signals should be done either with an indoor antenna or by subtracting 9 dB (or more) from the field strength measured outdoors at rooftop height. EchoStar Comments at 3, 6-7; *see* Hammett & Edison ("H&E") Statement at 3-4. This suggestion is unfair and inconsistent with the fundamental assumptions of the DTV transition, and would be an abuse of discretion if implemented by regulation.

EchoStar and its engineers acknowledge that indoor antenna performance is usually much inferior to that of a rooftop antenna. *E.g.*, H&E Comments at 3-4. Yet as EchoStar and H&E are well aware, *satellite* antennas ("dishes") *do not work at all* indoors. EchoStar and H&E provide no explanation for the gross unfairness of assuming that the same household that uses an *outdoor* antenna to receive DBS signals will use an *indoor* antenna to receive over-the-air signals. *See* Reply Engineering Statement of Meintel Sgrignoli & Wallace, ¶¶ 12-13 ("MSW Reply Engineering Statement").

Nor do EchoStar or its engineers explain why TV stations, which are in full compliance with the Commission's Orders concerning buildout and operation of their digital channels, should now forfeit large portions of their exclusive service areas. If the Commission had intended for consumers at the outer reaches of station coverage areas to use *indoor* antennas, it would have developed an entirely different channel allocation plan. Having instead premised the DTV transition on *outdoor* antennas, the Commission cannot now penalize broadcasters for doing

precisely what the Commission asked them to do. Indeed, were stations to comply with EchoStar's new standard by transmitting their DTV signals at power levels sufficient to reach indoor antennas 50 or 60 miles away, they would be in violation of the Commission's rules limiting ERP to prevent interference. The Commission should therefore reject EchoStar's proposal.

II. ECHOSTAR'S ARGUMENTS FOR ASSUMING AN INCORRECTLY-ORIENTED OUTDOOR ANTENNA ARE LIKEWISE WITHOUT MERIT

EchoStar also argues that the Commission should assume that outdoor over-the-air antennas are incorrectly oriented. EchoStar Comments at 3, 4-5, 7-8. Again, EchoStar fails to explain why such a rule should apply to broadcast signals when, if it were applied to EchoStar, its subscribers would receive no service at all. Nor does EchoStar even attempt to explain why it would be fair -- or good policy -- suddenly to assume use of an incorrectly-oriented antenna when the entire DTV transition has been premised on use of a properly-oriented rooftop antenna.

As discussed in NAB's initial Comments, in the SHVERA Congress sought to promote *local-to-local* digital service and to phase out all types of *distant* network stations. As Congress hoped, DIRECTV is planning a rapid rollout of digital local-to-local. DIRECTV Comments at 1-2. Thus, not only would assumption of a "mispointed" antenna (EchoStar Comments at 8) violate the assumptions behind the DTV transition, it would encourage use of the *undesirable* method of delivering digital signals -- namely, via distant stations from New York or Los Angeles.

EchoStar's engineers attempt to support this ill-advised suggestion by describing the results of a TIREM prediction of analog reception at 4.4 million "calculation points" in the United States. H&E Statement at 3. For several reasons, however, this study does not support EchoStar's proposal that the Commission should assume that antennas are improperly oriented.

First, as discussed in detail in the initial Engineering Statement of Meintel, Sgrignoli & Wallace in this proceeding, even if local TV station transmitters are situated in different directions, consumers can easily obtain rotors for their antennas -- and the Commission has always assumed use of such rotors in appropriate circumstances. MSW Statement, ¶¶ 43-45. In addition, in areas with transmitting towers in different locations, local installers often offer special, non-rotating antennas that point correctly at all of the local stations. *Id.*, ¶ 44.

Second, the TIREM study done by H&E sheds little light on the extent to which consumers can obtain their local network stations with a *fixed* antenna. For one thing, H&E does not appear to have made any effort to focus its study on where consumers actually *live*. Since the U.S. population is heavily concentrated in and around cities, and much of the land mass of the United States (such as the states of Nevada and Wyoming) is thinly populated, H&E's analysis is meaningless. *See* MSW Reply Engineering Study, ¶ 11 (percentage of *population* served is much higher than percentage of *land mass* served for 10 typical stations). The H&E study also ignores that, in many cases, whether certain stations' transmitters are located in different directions is *irrelevant* as a practical matter. (As H&E admit, some households are predicted to receive as many as 38 Grade B intensity signals over the air. H&E Statement at 3.) A consumer in Baltimore, for example, where the local Big-4 affiliate stations all have co-located towers, has no need to reorient her rooftop antenna in the direction of the ABC, CBS, Fox, and NBC stations in Washington, D.C. *See* MSW Reply Engineering Statement, ¶ 8.

Finally, the study done by Meintel Sgrignoli & Wallace looks at co-location of DTV towers in those markets that have a full complement of Big-4 affiliates (ABC, CBS, Fox, and NBC). MSW Statement, ¶ 44. As that study demonstrated, co-location of digital transmitters is the rule, not the exception. *Id.*

EchoStar's engineers assert that only 10-15% of outdoor antennas use a rotor. H&E Statement at 2. Even assuming that statistic was correct, it may simply reflect one or more of the following: (1) there is no need for an antenna rotor at the household because the local TV stations are co-located, (2) the household is in an area with strong signal strength and can rely on a nondirectional rooftop antenna, or (3) the household has a special antenna oriented towards two different sets of transmitters. In any event, since rotors are readily available at modest expense, there is no basis for breaking with the Commission's longstanding assumption that a household's rooftop antenna is properly oriented. *See, e.g., In Re Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, ¶ 38, ET Docket No. 00-90 (released Nov. 29, 2000) ("SHVIA requires . . . use of an antenna properly oriented towards the local network stations(s) at issue.").

H&E's suggestion (at 4) that in conducting site tests, engineers should orient the measurement antenna "in the same direction as other antennas in the area," violates the Commission's bedrock assumption of correct antenna orientation, which is universally recognized to be good engineering practice. It is also completely impractical. If, as will often be the case, nearby antennas are oriented in different directions, or if some consumers (who now subscribe to cable or DBS) have long-unused antennas on their roofs that are pointed in random directions, there will be no objective method for determining how "other antennas in the area" are pointed. In addition, if the DTV towers of nearby stations are not in the same location as the station's analog transmitters, the analysis will be still more confused. *See* MSW Reply Engineering Statement, ¶ 17.

III. ADOPTION OF ECHOSTAR'S PROPOSAL FOR A "99%" STANDARD WOULD BE CONTRARY TO THE ASSUMPTIONS BEHIND THE COMMISSION'S DTV PLANNING FACTORS

In connection with both site testing and Longley-Rice predictions, EchoStar urges treating households as unserved unless they are expected to receive, at least 99% of the time, a signal above the minimum field strengths set forth in 47 C.F.R. § 47.622(e)(1). EchoStar Comments at 9 (predictions); H&E Statement at 7 (testing), 11 (predictions). Although EchoStar acknowledges that the Commission's DTV planning factors are based on the assumption of service at least ***90%*** of the time, it advocates shrinking station's coverage areas by imposing a much higher time variability factor (***99%***) on TV stations for purposes of determining eligibility to receive a distant signal. *Id.*[2/] While advocating this radical change for broadcasters, EchoStar does not offer any data on the extent to which its *own* reliability is affected by factors such as rain fade or blockage by foliage.

As with the other suggestions discussed above -- indoor antennas and badly-oriented outdoor antennas -- EchoStar's "99%" proposal amounts to changing the rules in the middle of the game. If the Commission expected stations to be able to achieve a 99% time variability factor, it would not have "define[d] DTV service areas on the basis of stations' noise-limited F(50,90) contour." Notice of Inquiry, ¶ 10. Because of this definition, stations could not possibly -- without egregiously violating the Commission's rules -- meet a 99% time variability test in the outer portions of their DTV service areas. Punishing stations that have fully complied

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[2/] There appears to be no dispute among the commenters that the Act does not now permit a DBS company to sign up a subscriber for a distant digital signal based on a *prediction* about over-the-air digital signal strength. NAB Comments at 3-4. Rather, under the Act, only an actual *site test* can establish that a household is "digitally unserved." While the Commission should work on developing a digital predictive model for (possible) use after the DTV transition is complete, there are, very serious practical problems with implementing a "digital ILLR" model in the short term. *Id.* at 33-38.

with the Commission's transition plan by allowing EchoStar to invade these areas with duplicative programming on digital signals from New York or Los Angeles would be arbitrary and capricious.

IV. ALTERATION OF THE SIGNAL STRENGTH LEVELS SET FORTH IN SECTION 73.622(e)(1) OF THE COMMISSION'S RULES FOR PURPOSES OF SHVERA TESTING IS UNNECESSARY AND CANNOT BE DONE BY REGULATION

For purposes of site tests of digital field strength, EchoStar urges that the minimum field strengths set forth in Section 47 C.F.R. § 73.622(e)(1) of the Commission's rules be increased by several dB. As discussed below, the Commission could not make such a change itself, because the SHVERA codifies, by statute, the minimum signal strengths that define which households are digitally "served" or "unserved." Moreover, even if EchoStar were correct about the time variability issue, the DTV planning factors already contain a substantial "safety factor" that makes such an adjustment unnecessary, particularly if a household uses a preamplifier to improve its reception – which the Commission recommends if the household is in an area of relatively low signal strength.

First, the Commission itself could not by regulation increase the signal strengths that qualify a household as "served," because to do so would be contrary to the express dictates of the Act. To ensure against any expansion of the scope of the new compulsory license based on testing of over-the-air digital signals, Congress *locked in* the specific dBu levels currently set forth in Section 73.622(e)(1) of the Commission's rules. *See* 47 U.S.C. § 339(a)(2)(D)(vi)(I) (subscriber is eligible for a distant signal "if such subscriber is determined . . . not to be able to receive a signal that exceeds the signal intensity standard in section 73.622(e)(1) of title 47, Code of Federal Regulations, **as in effect on the date of enactment of the Satellite Home Viewer Extension and Reauthorization Act of 2004**") (emphasis added). For example, since the

minimum signal strength for a UHF digital signal is 41 dBu under Section 73.622(e)(1), the Commission could not declare a household to be unserved if it is measured to have a signal strength of 45 dBu for a nearby UHF station.

Second, because the Commission's planning factors for DTV service are already very conservative, there would be no justification for increasing, still further, the minimum signal strength that defines a household as "served" by a digital TV signal. The following are just a few of the ways in which the DTV planning factors *over*estimate the signal strength that must be available for a household to be able to receive digital TV signals:

- real-world UHF antennas (such as the Channel Master 4228) have gains that substantially exceed those assumed in the planning factors (*see* MSW Engineering Statement, ¶ 45-46);
- readily-available brands of coaxial cable have lower losses than those assumed in the planning factors (*see id.*, ¶ 53); and
- low-noise amplifiers can, at modest cost, offer a household 15, 20, or more dB better than the DTV planning factors assume (*see id.*, ¶¶ 49-51).

Unless the Commission is prepared to adjust the planning factors to take into account these factors -- which would *expand* stations' coverage areas -- it cannot consider implementing EchoStar's proposals to *shrink* stations' coverage areas by adding an additional time variability factor.[3/]

[3/] Although Hammett & Edison state that they have "collected temporal data on the amplitudes of fourteen DTV signals," H&E Statement at 6, they disclose the results of only *six* of these 14 tests. *See* H&E Statement at 6 ("*Some* of the temporal data are shown in Figure 1.") (emphasis added); *id.*, Figures 1A-1C (showing results for six stations). Because H&E offers no explanation for its decision not to disclose the results of 57% of its "temporal data" tests, the Commission should not rely on the results that H&E selectively chose to disclose.

V. THERE IS NO REASON TO ALTER THE FCC'S EXISTING SITE MEASUREMENT PROCEDURES TO ACCOUNT FOR MULTIPATH

EchoStar argues that the Commission should recommend increasing the signal strength that defines a household as "served" -- as a "penalty" in light of possible multipath problems. EchoStar Comments at 5.

In support of this argument, Hammett & Edison cite (at 8) data from some of the DTV field measurement campaigns, claiming that, at 12% of tested sites, there was sufficient signal strength but still no picture. H&E's figure -- in effect, an 88% success rate -- is similar to, but slightly lower than, the 90% figure reported by Meintel Sgrignoli & Wallace in their Engineering Statement. (That is, Meintel Sgrignoli & Wallace report that, nine out of ten times, getting a signal above the DTV minimums translated into a high-quality digital picture.)

The reasons the MSW 90% figure is more reliable than the H&E 88% figure include the following: (i) the percentage reported by MSW is based on more complete set of data (from 15 testing campaigns), and (ii) the MSW figure averages the percentages from each campaign, rather than averaging the entire body of tests, to avoid unduly emphasizing those testing campaigns in which the sample size was unusually large. MSW Reply Engineering Statement, ¶¶ 28-29.

As demonstrated in NAB's initial filing, the 90% figure cited by Meintel Sgrignoli & Wallace would be higher if the same tests were done today, because the latest generation of DTV receivers is far better than earlier generations at achieving a high-quality picture in spite of even severe multipath problems. MSW Engineering Statement, ¶¶ 68, 93-103. Nor has technical ingenuity been exhausted in this area: soon, *sixth* generation boxes will be available that will be better still. MSW Reply Engineering Statement, ¶ 16.

Hammett & Edison also suggest increasing the signal strength required to be considered "served" to account for white noise enhancement that occurs when equalizers attempt to overcome multipath. H&E Statement at 8-9. (Although H&E mention 2 dB as a high figure, *id.* at 9, their own tests show average white noise enhancement of only 0.2 dB, *id.* at 13.) Again, however, any small increase in white noise caused by equalizers is much more than offset by the factors that currently make the DTV planning factors *conservative*, including the large gains available from use of a preamplifier.

VI. ECHOSTAR'S CLAIMS ABOUT MAN-MADE NOISE ARE INACCURATE AND DO NOT REQUIRE ANY CHANGE IN SITE TESTING PROCEDURES OR LONGLEY-RICE

Strangely, EchoStar argues, based on a 2001 NTIA report, that manmade noise presents a major threat to reception of low-band DTV channels. But that study says exactly the opposite: the authors find that man-made noise in *residential* areas is very low -- only 3.6 dB. Robert J. Achatz & Roger A. Dalke, *Man-Made Noise Power Measurements at VHF and UHF Frequencies*, NTIA Report No. 02-39, at 25 (Dec. 2001). The figure quoted by H&E (at 10) -- referring to median noise levels approaching 20 dB -- is for *business* areas, not residential areas. *Id.* In addition, far from finding that man-made noise is increasing, another NTIA report found that "residential [man-made noise] has *decreased dramatically*." R.J. Achatz *et al.*, *Man-Made Noise in the 136 to 138-MHz VHF Meteorological Satellite Band*, NTIA Report 98-355, at 31 (1998) (emphasis added).

EchoStar's claims about man-made noise are, in any event, limited to low-VHF stations. Under current DTV channel assignments, only a little more than two dozen ABC, CBS, Fox, or NBC stations are expected to transmit their digital signals on low-VHF channels, and that

number is likely to decline in the next stages of the transition to 2% or less of all Big-4 affiliates. *See* Reply Engineering Statement of Meintel Sgrignoli & Wallace, ¶ 32.

If the Commission *were* to conclude that there is a concern about man-made noise with low-VHF digital channels, the way to address it would be to alter the plans for the DTV transition – for example, by authorizing low-VHF digital channels to transmit at higher power. If that occurred, the Commission could consider – as part of an integrated package -- urging Congress to raise the dBu levels that qualify a household as "served" by a digital low-VHF station.[4/] Moreover, penalizing those broadcasters using low-VHF digital channels by deeming substantial portions of their markets "unserved," when the stations are doing exactly what they are supposed to do to replicate their analog service areas in conformity with the Commission's DTV transition plans, would be arbitrary and without justification.

VII. NONE OF ECHOSTAR'S OTHER ARGUMENTS HAVE MERIT

Based on measurements performed by Hammett & Edison, EchoStar argues that differences in receiver sensitivity warrant an increase in the minimum dBu levels that make a household "served" by a digital signal. EchoStar Comments at 4. For four reasons, the Commission should reject that suggestion. *First*, as discussed above, only Congress can change the minimum dBu levels for purposes of SHVERA, so the Commission could not lawfully implement EchoStar's suggestion on its own in any event. *Second*, none of H&E's tests was of a fifth-generation receiver, and one of the models tested was virtually an antique (from 2000). *Third*, H&E incorrectly used over-the-air signals, rather than signals generated in the lab, in doing its receiver sensitivity tests, which makes it impossible to determine whether the claimed

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[4/] As discussed above, Congress would need to take that step, because SHVERA locks in the specific dBu levels set forth in 47 C.F.R. § 73.622(e)(1) for purposes of determining eligibility to receive distant digital signals.

differences in sensitivity are due to (for example) multipath, rather than to differences in receiver sensitivity. MSW Reply Engineering Statement, ¶¶ 40-41. *Fourth*, even though H&E tested only early-generation receivers, the differences in sensitivity are small and well within the "safety zone" that already exists in the DTV planning factors, particularly given the easy availability of preamplifiers that greatly improve on the performance assumed by the Commission in the DTV transition process. *Id.*, ¶ 43.

Hammett & Edison also raise a concern about possible future interference issues. (H&E Statement at 14-15.) They offer no data in support of this speculative concern, and EchoStar itself does not urge any change in testing procedures or in the Longley-Rice model based on it. In any event, a properly-oriented directional rooftop antenna – which EchoStar disparages but the Commission has always assumed as the standard – minimizes interference problems. *See* MSW Reply Engineering Statement, ¶ 47.

Conclusion

For these reasons, the Commission should make recommendations concerning testing and prediction of over-the-air digital signals in accordance with the suggestions discussed above and in NAB's initial comments.

Respectfully submitted,

/s/

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July 5, 2005

Before the
Federal Communications Commission
Washington, D.C. 20554

In Re Technical Standards for Determining	)	
Eligibility for Satellite-Delivered Network	)	**ET Docket No. 05-182**
Signals Pursuant to the Satellite Home	)	
Viewer Extension and Reauthorization Act	)	

Reply Engineering Statement of Meintel, Sgrignoli, & Wallace Concerning Measurement and Prediction of Digital Television Reception

1. At the request of the National Association of Broadcasters, the undersigned have prepared this Reply Engineering Statement for consideration by the Commission in connection with its inquiry into available methods for measuring and predicting the ability of households to receive over-the-air digital television signals.

2. This Reply Engineering Statement is principally directed to the Statement submitted by Hammett & Edison ("H&E") in support of the Comments filed by EchoStar on June 17, 2005. The H&E Statement discusses the six primary issues described in the FCC's Notice of Inquiry regarding the SHVERA. Below, we address H&E's comments on each of these issues.

Consumer Receiving Antennas

3. **Outdoor Receiving Antennas and Rotors**. H&E correctly states that "implicit in the Commission's distant network eligibility rules is the assumption that all viewers employ outdoor directional antennas, which are adjusted (rotated) to achieve optimum reception." (See 47 CFR § 73.686(d)(2)(iv) as well as OET Bulletin No. 72.) This is consistent with the FCC's statement in its Notice of Inquiry that households are expected to "exert similar efforts to receive DTV broadcast stations as they have always been expected to exert to receive NTSC analog TV

signals." Notice of Inquiry, ¶ 6. This assumption was the basis of the entire DTV transition, including the channel allocations (RF channel, effective radiated power, antenna patterns, etc.) that were premised on DTV reception via properly aimed *outdoor* antennas. Likewise, direct broadcast satellite (DBS) reception requires an *outdoor* antenna oriented in a particular direction, often with much more precise adjustments than terrestrial antennas and with absolutely no blockage of the signal's direct path. It would be unreasonable to assume "mispointing" of terrestrial antennas by the same households that must precisely orient their satellite antennas to obtain any reception at all.

4. H&E asserts that "only a small fraction (perhaps 10-15%) of households having outdoor antennas also utilize an antenna rotor." But H&E does not evaluate how many of these households actually *need* a rotor for reception of over-the-air TV stations. As discussed in our initial Engineering Statement, many households are located in areas where four nearby network-affiliated transmitters are effectively co-located and there is no need for an antenna rotor. In any event, the statement in the Notice of Inquiry – that viewers are expected to exert efforts to receive digital TV signals comparable to those the Commission always expected them to exert to receive NTSC signals – is reasonable.

5. The use of a rotor, whether for analog or digital reception, has always had to address the issue of latency. But there is nothing new about that issue. And thanks to modern technology, this concern has been minimized: consumers can acquire fast-moving motorized rotors or electronically-steerable antennas that are automatically controlled by a television set (see MSW Engineering Statement, ¶ 44). Consumers can also acquire rotors that remember the exact location of the antenna direction needed for good signal reception.

6. **Antenna Pointing Errors**. H&E asserts that "in most markets, not all television stations transmit from a common site." H&E used the Terrain Integrated Rough-Earth Model ("TIREM"), as opposed to the Longley-Rice model, to analyze the coverage area of all full-service NTSC stations in the U.S. over a random sample of 4.4 million calculation points. H&E states that for those households that could receive two or more NTSC (presumably Grade B or better) signals, the majority had at least one station separated by 25 degrees from the rest. This result, they claim, would cause degraded reception (about 3 dB lower received signal level since 25 degrees is the half-power point of the reference antenna assumed in the FCC planning factors). H&E then asserts that most weak-signal "fringe" viewers in their study would receive signals from stations that were more than 25 degrees apart from each other. They conclude, "from these data, it seems clear that most viewers will not be able to receive optimally all available DTV stations without a properly oriented rotatable antenna."

7. Of course, the Commission *assumed* use of a properly-oriented rooftop antenna in planning the DTV transition, so it would not be surprising if some households needed to use rotors to ensure that their antennas are properly oriented. But in any event, the H&E study exaggerates the extent to which households will need to use rotors.

8. For one thing, the H&E study ignores the fact that, in many cases, a viewer will have no need to reorient an antenna to point it towards a transmitter in a different direction. Particularly in the crowded Eastern Seaboard, but in many other areas as well, many households are predicted to get two (or more) affiliates *of the same network* over the air. A household in Baltimore, for example, can receive the local ABC, CBS, Fox, and NBC stations over the air without a rotor, because the four Baltimore affiliates have essentially co-located towers. Although the household may *also* be predicted to receive a Grade B intensity signal from the

Washington, D.C. Big-4 affiliates, there is no need for the household to acquire a rotor when the same network programming is available from the Baltimore stations.

9. In addition, the H&E study appears to have included all stations and not just the Big-4 network affiliates relevant to the SHVERA. The antenna re-orientation they describe would likely be reduced greatly if one considered only the signals of network affiliates. And if a household at the outer edges of the coverage area of local stations wishes to receive other local TV stations, a directional antenna with a rotor will probably be necessary in any event.

10. As described in our initial Engineering Statement (¶ 44), in many U.S. markets (112 of 135, or 83%, of those markets with all four network affiliates), viewers at some distance from the transmitter see essentially co-located transmitter sites (i.e., the angle of separation is much less than 25 degrees). Viewers in these areas can therefore use a *single* antenna (meeting the FCC's planning factor of ±25 degrees) oriented in the general direction of the transmitter sites for good DTV reception of the four network-affiliated local stations. For those locations in these markets where stations are separated by a larger angle, and in markets in which towers are not co-located, a rotor (or dual-antenna system) can be employed for households in areas of relatively low signal strength. If a household in an area of relatively weak signal strength needs to compensate for the small loss of dB caused by slight differences in angle to different stations, a low-noise amplifier will more than make up the difference.

11. The H&E study also suffers from a separate problem: the points selected were apparently randomized based on *land mass*, rather than on where households are actually located. To illustrate this point, we analyzed the digital UHF signals of 10 network-affiliated stations located in various types of terrain, using the FCC's OET-69 methodology with 1-km cell size and, per the Commission's instructions for the ILLR model, ignoring Longley-Rice error

flags. Within the station's predicted Grade B contours, this study examined 365,527 cells. The study found that 96.1% of the *population* in the cells was predicted to receive a field strength at or above the 41 dBu threshold, but that only 83.9% of the *cells* were predicted to be above the threshold. In other words, the cells that were predicted to be served were more heavily populated than the cells predicted to be unserved. Randomly selected locations are thus *not* a good indicator of overall service availability; the points selected for analysis must be representative of where people actually live. This result also indicates, as one would expect, that TV stations seek to deliver signals where the population is located and not waste power reaching areas where there is no population.

12. **Indoor Antennas**. H&E correctly states that "indoor receiving antennas are generally not very directional, have less gain than most outdoor antennas, and are often not easily adjusted." They go on to say that "[t]he service signal strength levels specified by the FCC in Section 73.622(e), which are predicated on the use of an outdoor antenna, are inadequate when the receiving antenna is an indoor model." On this much, there is agreement, at least for viewers in the outer reaches of a station's service area. Compare MSW Engineering Statement, ¶¶ 37-38. The superiority of rooftop antennas to indoor antennas is the very reason the FCC's planning factors were based on directional *outdoor* antenna reception; otherwise there would be no way to give all NTSC stations an extra 6 MHz channel without causing excessive interference to each qualifying television station during the transition. The entire DTV channel allocation, including transmitter antenna patterns and ERP, were critically based on the assumption of a directional outdoor antenna. While indoor DTV reception will be possible in many areas where the signal strength inside households is sufficient and newer 5th generation receivers are

employed, a household should not be considered "unserved" if it can receive a digital signal with a directional rooftop antenna.

13. In addition, as pointed out in our initial Engineering Statement (¶ 40), outdoor directional antennas that are properly and carefully pointed provide better and more reliable performance for *both* terrestrial DTV and DBS services. Since DBS antennas must be properly mounted outside, it is reasonable to assume that antennas for terrestrial DTV reception will (at least in areas of weaker signal strength) likewise need to be mounted outside.

Cluster Measurements

14. **Antenna Rotation**. The Commission's existing rules for testing of signal strength at individual households call for measurements at a cluster of five locations (within a three square meter area) near the household. Each of the five measurements is to be made with the antenna pointed to receive maximum signal strength. The purpose of this is to take into account the location variability at a particular site. The mean value is considered the field strength at the site, and accounts for variations in signal strength due to multipath from objects near and far.

15. H&E states that "the small percentage of consumers having or using rotatable antennas calls into question continued justification of the requirement under Section 73.686(d) that the measurement antenna be rotated for greatest signal strength." As discussed above, this is not a reason to abandon the long-standing FCC requirements for antenna orientation for maximum signal strength, nor the requirement that viewers exert the same efforts to receive DTV signals as they have done in the past with analog NTSC (including use of a rotor, when needed).

16. H&E also comments that "the direction of maximum signal strength often produces a poor picture (or no picture in the case of DTV)." This implies that signal strength is not a good metric for predicting successful DTV reception. But actual measurements show that this implication is incorrect. Some very early DTV receivers sometimes required a narrow range of antenna pointing angles in order to use the antenna's null to minimize the multipath that the equalizers could not handle (*e.g.*, multipath longer than the equalizer hardware). However, the vastly improved performance of the 5th generation ("5G") DTV receivers, as described in our initial Engineering Statement (¶¶ 93-115), can easily handle these multipath conditions. Even with older DTV receivers, field tests yielded encouraging results: a net 90% accurate prediction rate of DTV reception when the measured field strength was above the FCC minimums (*e.g.*, 41 dBμV/m for UHF). The new 5G receivers (expected out in the market by fall 2005) are significantly better than the first three generations used in the early field tests, and would have provided an even higher accuracy of predicted DTV reception based on field strength alone. The 6th generation of DTV receivers – expected soon -- will be better still.

17. H&E also suggests that "[i]t would seem logical when taking cluster measurements to orient the measurement antenna in the same direction as other antennas in the area, since it can be assumed that those antennas would be oriented toward a direction that provides the best reception overall (but perhaps not optimum for any station)." We do *not* recommend making such assumptions since there is no way of knowing if those antennas are actually being used within those homes; if they are being used for analog or digital; or if they are properly adjusted to receive a good signal or have been adjusted by the prevailing winds in the area. Nor would there be any simple, standard method for determining which "other" antennas should be considered, *e.g.*, if the household is a long distance from any other residence.

18. In addition, newer antennas will be electronically steerable under control of an algorithm in the DTV receiver via the current CEA909 interface standard, and will adjust automatically (without viewer interaction). In the meantime, the current batch of rotors on the market (including one with memory that automatically adjusts the antenna to the previously stored position for a given channel) can be employed with good success.

19. **Time Variability**. As H&E point out, prediction of DTV reception assumes at least 50% of the locations and 90% of the time, as determined by the Commission. When making cluster measurements at five nearby locations (*i.e.*, covering a 3 square meter area) over a relatively short period of time, only location variability is being determined, not time variability. H&E states that since a "single set of cluster measurements is assumed to capture the median time signal strength value, it cannot adequately characterize the time variability to provide reasonable assurance that the DTV signal will be available 90% of the time."

20. H&E proposes that the test measure the five cluster locations, find the median value, and assume that it represents the median time value. Then, H&E would subtract from the measured field strength a value (in dB) equal to the difference in the FCC(50, 50) and FCC(50, 90) curves for that particular distance from the transmitter and the transmitter's height above average terrain ("HAAT").

21. In support of this proposal, H&E performed a small field test over a two-week period in May 2005. Fourteen DTV signals were measured (although only six were reported in the comments and no explanation was given as to why the other eight were left out) in their Sonoma, CA office.

22. It is generally accepted that time variability is a *long-term* measurement process – including multiple seasons -- to properly determine the statistics for a given location. The

original TASO studies in the late 1950's that provided the current FCC statistical propagation curves were meticulously determined from testing and evaluation performed over a three-year period. In most cases, data were collected over a period of at least six months and sometimes longer than two years, and for a multitude of locations (FCC Office of Chief Engineer Report No. R-6602). Therefore, a measurement program consisting of only six paths taken over a two-week period is not statistically valid and has little value, particularly when the other eight tests conducted are not reported. Nevertheless, the results for this short-term test illustrate some known facts about RF propagation. Short, line-of-sight paths have Ricean characteristics (one strong, main path with smaller amplitude delayed paths) and have minimal variance about the mean (*e.g.*, 2-3 dB) while longer line-of-sight paths have more signal strength variability.

23. H&E's assumption that the measured signal strength represents the median over time is unlikely to be correct: 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. According to FCC Report No. R-6602 discussed above, signal strengths for UHF signals are roughly 2 – 3 dB lower during the daytime, depending on the path distance. Thus, signal strength measurements during the daytime are likely to be *below* the median over time.

24. H&E also discusses the plethora of empirical data from field measurements that concerns *narrow*-band RF signal level variations (including the 1971 NTIA report by Longley et al comparing predicted and measured values). They also state that the "FCC's statistical propagation curves and the Longley-Rice propagation model are based upon the statistical distributions of such data." But they question whether this applies exactly to *wide*-band DTV signals or not. The issue is whether the "wide-band" 6 MHz channel is wide enough to require different statistical propagation methods or models. However, it has been our experience, after

conducting thousands of DTV measurements, that the signal level across the 6 MHz DTV channel is in general fairly even.

25. **90% vs. 99% time variability**. H&E then suggests that even though the DTV transition is based on 90% time variability, the figure should be raised to 99% for purposes of determining whether households are "unserved."[1/] They assert that with a 90% figure, there will be DTV signal failure 10% of the time, or 36.5 days per year. But that assertion does not fairly capture the meaning of the 90% time variability assumption. First, the assumed 10% loss of service is *only* at the outermost limit of the service area; it is not a "typical" figure across the station's entire service area. *Second*, these 36.5 days are not consecutive, nor is the particular time or duration that these "outages" occur known. Many outages are likely to occur during parts of the day when no one is watching or be of such short duration that they only cause a momentary service interruption. *Third*, even for the very small percentage of households at the very edge of the station's service area, the household can improve its reception (and reduce the number of outages) substantially with a mast-mounted low-noise amplifier ("LNA").

26. *Finally*, and most important, the entire DTV allocation process was based on certain key assumptions, and one of these is the 90% time variability value. According to H&E, the 99% time variability requirement would require a 17.5 dB UHF correction factor, based on the six tests that they elected to report. Since stations cannot deliver these additional dB without violating the Commission's limits on ERP, it is difficult to see how stations can fairly be penalized (through loss of viewers) for not meeting this brand-new standard.

1/ EchoStar does not cite any figures about its own service reliability, or about the extent of problems caused by "rain fade" or by obstructions created by trees, buildings, or other physical obstacles. DBS rain fade, for example, can occur even in relatively dry areas, if the signal passes through rainy areas on its way from the satellite (above the equator) to the satellite dish.

Factors Other Than Signal Strength that Affect Reception

27. H&E discuss four commonly known factors that affect DTV reception: C/N, multipath, noise interference (particularly impulse noise on low-VHF), and interference from other signals (both analog and digital). While H&E claims that "adequate signal strength is necessary but is not, by itself, sufficient for DTV reception," the available data show that even with early-generation receivers, signal strength predicts successful reception 90% of the time, and that figure will be greatly improved with the new 5G receivers.

28. H&E asserts that the data show an 88% (rather than 90%) System Performance Index (*i.e.*, percentage of locations with above-minimum signal strength that also achieve successful reception). But H&E does not rely on the data obtained *after* the cited August 1999 paper was released. The August 1999 paper refers only to field tests with receivers that use first and second generation VSB decoder chip sets.

29. In addition, in the calculations reported in our initial Engineering Statement, we reported the average of the SPI percentages for each testing program. Because some of the programs had (for irrelevant reasons) much larger sample sizes, this method more accurately captures the national picture. (H&E also cites percentages for *indoor* reception, which should not be considered for the reasons stated above.)

30. In addition, 5G receivers offer striking performance improvements compared to older receivers. Even H&E agrees that "[f]uture DTV receivers will undoubtedly be able to produce a DTV picture in some locations where the earlier receivers could not ...." In the early field tests, many of the failed DTV sites with signals above the minimum FCC required level were due to the following equalizer hardware problems with the Grand Alliance receiver: (1) both pre-echo and post-echo multipath existed that was longer than the Grand Alliance receiver's

equalizer hardware, (2) faster dynamic multipath existed than what the equalizer could handle (either due to the very slow Automatic Gain Control ("AGC") speed or the fact that the equalizer hardware that canceled long multipath used only the training signal and not the data itself), or (3) strong multipath caused the receiver to not lock up or the equalizer to diverge from the optimum solution. All of these issues have been dealt with in the latest generations in receivers, culminating in the new 5G performance. The 5G receivers can handle much stronger, longer, and faster multipath than the earlier generations of DTV receivers.

31. H&E also refer to (worst case) white noise enhancement that affects the threshold value of the DTV receiver when its equalizer is canceling or minimizing large multipath. While multiple equalizer taps become active to *cancel* the correlated multipath, the statistically independent tuner input noise samples passing through each of the taps add up at the output to enhance the noise. Therefore, the impairment-free 15 dB signal-to-white-noise error threshold is increased to some value slightly higher, which requires the incoming signal to be slightly higher. However, this calculation is a *worst* case number, and is indicative of typical feed-forward, tapped delay line type of equalizers that do not use any noise-reduction circuitry. (H&E report (at p.13) *typical* white noise enhancement values of only 0.2 dB.) The small amount of noise enhancement in DTV receivers, some of which has been reduced in the new 5G receivers, is easily mitigated through the use of a mast-mounted LNA.

32. Man-made noise is an issue that relates primarily to low-VHF channels. As described in our initial Engineering Statement (¶ 13), very few network-affiliated stations (28 out of about 846 total full power Big-4 network affiliate stations, or about 3%) are currently scheduled to use low-VHF. (H&E report essentially the same figure.) We have determined that 8 of these 28 stations had no choice in the first round channel election since both their analog and

digital channels were in the low-VHF band. In addition, 5 others had elected a low-VHF channel since their other channel was out of the FCC's designated core spectrum (channels 2- 51). We believe that a number of these stations will elect to move off the low-VHF band when given the opportunity in the third round of the DTV channel election, which is scheduled to occur next spring. Still other stations may depart the low-VHF band for other reasons. This may leave 2% or less of all network-affiliated stations on low-VHF.

33. Because of the lack of empirical data, it is not known whether the minimum-signal levels specified in the DTV planning factors for low-VHF DTV reception will be sufficient to overcome natural and man-made impulsive noise in difficult reception situations. Should the Commission conclude that there is a concern about impulsive noise for low-VHF DTV, the solution would be to authorize higher ERP levels for these channels. If the Commission did so, it could then recommend to Congress increasing the minimum signal levels that define a household as "unserved." It would be inappropriate, however, to punish stations for failing to deliver signal levels that the Commission's own rules prevent them from delivering.

Predictive Model

34. H&E discuss the possibility of alterations to the ILLR model used in the SHVA context. These suggestions are in the areas of:

- use of F(50, 90) or F(50, 99) statistics for DTV
- use of building penetration loss (for indoor DTV reception); and
- antenna / tuner mismatch loss and DTV receive system noise figure increase

35. **Use of F(50, 90) or F(50, 99) statistics for DTV**. The ILLR model for DTV should be based on field strength predictions using F(50, 90), just as is done with DTV application processing . To use 99% of the time for determining distant-network programming

availability when the entire DTV broadcast allocations were based on F(50,90) would be unfair to the local broadcaster who is following the rules set down by the Commission. To meet the 99% standard would require higher transmitting power (causing much more interference) than was allocated to DTV channels. To change the rules at this time in the transition would be unfair to broadcasters who have built their facilities as required based on the FCC planning factors. In addition, as discussed above, time variability issues can be mitigated with a mast-mounted preamplifier that can provide 12 – 15 dB of margin (or more) beyond what the planning factors require.

36. **Use of building penetration loss (for indoor DTV reception)**. As shown previously, indoor DTV reception should not be considered for distant-network programming determination, but rather only outdoor directional antenna reception.

37. **Antenna / tuner mismatch loss and DTV receive system noise figure increase**., Any additional impedance mismatch loss between the antenna and the tuner, as well as a higher DTV receiver noise figure, can be mitigated by a mast-mounted LNA. The LNA isolates the antenna impedance from that of the downlead coaxial cable and the DTV tuner input impedance, and also provides an output impedance much closer to the 75 ohm coaxial cable impedance. Therefore, the DTV tuner will see an impedance at the output of the coaxial downlead cable (*i.e.,* at its own input) that is much closer to the matched condition under which it is tested.

38. Both mismatch loss and noise figure enhancement are significantly reduced with the use of a low-noise, mast-mounted preamplifier that has good isolation capability and a well-controlled input and output impedance. When the entire receive system is considered, the

preamplifier mitigates the problems entirely by providing additional margin (12 –15 dB or more over that of the FCC planning factors).

Variability Among Consumer Receivers

39. H&E acknowledges that "[c]onsumer receivers continue to evolve." They tested five DTV receivers (four consumer and one professional model) and found that sensitivity did not meet the FCC planning factors of –81.2 dBm for VHF and –84.2 dBm for UHF, but rather were 2 – 6 dB below the goal stated in the FCC planning factors.

40. The traditional test methodology to determine compliance for the FCC planning factors is to perform a well-controlled *laboratory* test with easily repeatable results. This entails using a well-defined 8-VSB RF source (SNR values of >30 dB, absolutely constant DTV level and minimal splatter, no multipath or antenna-like signal spectrum tilt, no other adjacent channel signals, etc.) before carefully attenuating the signal to threshold of errors. However, the H&E test was performed with an off-air (rather than a laboratory) signal, and no levels of multipath or interference were cited.

41. The first three receivers tested by H&E (the LG LST-4200A, Samsung SIR-T451, and Motorola HDT101) are more recent units, all probably of the 4th generation vintage (*i.e.*, the VSB decoder chip). The measured sensitivity levels for these three newer units were found to be off by 2.3 dB at CH 12 and a maximum 3.8 dB at UHF. How much of this problem is due to any existing short delay multipath or interference cannot be determined from their test data.

42. The last two units are much older units (RCA DTC 100 is considered generation 1.5, and the Zenith DTV Demod-S is either 2nd or 3rd generation depending on when it was purchased). Both of these early units were known to have much worse sensitivity performance. The two paper references cited in the H&E comments regarding earlier published test results are

from presentations given in April 2000 at the NAB conference. Based on that date, it means that these tested DTV receivers (described in both those presentations) were either first- or second-generation consumer receivers. However, it is important to determine the performance of 5G DTV receivers with regard to not only sensitivity, but also to multipath and interference performance. As shown in our initial Engineering Statement (¶¶ 93-115), the 5G receivers are significantly improved in many areas.

43. Variations in DTV receiver sensitivity can be caused by a number of design issues (*e.g.*, high tuner noise figure, lack of enough IF gain, equalizer noise enhancement due to a poor algorithm, internally-generated beats within the RF and IF band, etc.). While the noise figure of some robust DTV receivers (robust in terms of multipath and interference) may in the worst case be 10 dB (rather than 7 dB in the planning factors), that effect can be mitigated where necessary with a mast-mounted LNA. But as shown in our initial Engineering Statement (¶¶ 49-51), these sensitivity variations are small enough that, along with other planning factor variations, a mast-mounted low-noise preamplifier can mitigate all of them together.

Building Penetration Loss and Clutter

44. **Building Penetration.** H&E refers to building penetration losses for *indoor* testing of DTV reception. For the reasons stated above, we do not believe that indoor field testing should be considered. Likewise, Longley-Rice prediction should not be considered for anything other than outdoor directional antenna reception.

45. Even if predictions based on indoor antennas were appropriate, the wide variability in indoor reception conditions would make such predictions extremely difficult. For example, the 1992 building attenuation study cited by H&E conducted in England for a six-story building varied from 16.4 dB at ground level to only about 2.5 – 4.2 dB at the top floor.

However, the related chart in the H&E comments indicate some unexpected results, with the building attenuation *increasing* as the height increases for the first couple of floors before decreasing with increasing height as would be expected.

46. Studies from indoor field tests in the U.S. have found that there is a great variance in the signal levels found indoors versus that found at 30' above ground level immediately outside the house under test. Besides the obvious signal decrease in signal strength due to a lower receive antenna HAAT (although there are some exceptions), building attenuation can vary significantly depending on house construction types and materials. Parameters that cause great variation in indoor signal strength are: single-story versus multi-story, type of construction such as brick, frame, aluminum siding, the number and size of windows and doors, the directions that the windows are facing with respect to the transmitter, the internal wall construction of plasterboard versus plaster over wire mesh, etc.

47. **Interference**. H&E mention the issue of interference, but do not offer any specific recommendation relating to that issue. Of course, a directional rooftop antenna with a good front-to-back ratio has always been helpful in combating interference. In addition, current DTV receiver design has improved significantly on the performance of earlier generations of DTV receivers in handling interference. Improvements in overload characteristics provide better inter-modulation and cross-modulation performance as well as image performance. Some suggested improvements have been made publicly,[2/] such as wideband tuner AGC, but the final verification is laboratory and field testing of actual consumer units.

48. **Clutter**. H&E refers to including "realistic clutter factors in the predictive model used for DTV coverage," but proposes no specific values. As discussed in our initial

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2/ Charles Rhodes and Gary Sgrignoli, *Interference Mitigation for Improved DTV Reception*, 51 IEEE Transactions on Consumer Electronics, No. 2 (May 2005).

Engineering Statement, the Longley-Rice model is both very accurate in predicting whether particular locations can receive a signal above the Commission's threshold levels *and* well-balanced between overpredictions and underpredictions.

Respectfully Submitted:

_____/s/_____
William Meintel

_____/s/_____
Gary Sgrignoli

_____/s/_____
Dennis Wallace

July 5, 2005

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Remington Arms Company, Inc.	)	ET Docket No. 05-182
Request for Waiver of Part 15	)	
	)	

SBC'S REPLY COMMENTS[1]

As with other parties in this proceeding,[2] SBC is concerned about the interference effects of Remington's device with other transmitting devices in the 2.4 GHz band. The device's transmit power of 1000 mW will cause interference to all other systems in the vicinity operating in the same frequency. The video surveillance application of the device will generate a continuous waveform for the entire period the device is in operation, making the spectrum unusable by any other devices within range. Depending on the surrounding environment, such interference could degrade the performance of—or render completely inoperable—other systems as far away as a few hundred meters to a few kilometers. Specifically, the Remington device could render inoperable WiFi systems within the vicinity of the device. Given the rapid proliferation of WiFi systems, the interference caused by Remington's device thus could have far-reaching effects: it could effectively disable wireless broadband access for anyone within range of the device. The Commission should give strong consideration to the magnitude of such effects. At a minimum, the Commission should impose stringent use and user restrictions, *e.g.*,

1 SBC Communications Inc. files these reply comments, on behalf of itself and its wholly-owned subsidiaries, including: Southwestern Bell Telephone LP, Pacific Bell, Nevada Bell, Ameritech Illinois, Ameritech Indiana, Ameritech Michigan, Ameritech Ohio, Ameritech Wisconsin, the Southern New England Telephone Company, ASI, AADS Illinois, AADS Michigan, AADS Indiana, AADS Ohio, AADS Wisconsin, SBC LD, and SBC Telecom (collectively "SBC").

2 *See, e.g., Cisco Systems Comments.*

limiting the sale and use of the device to federal, state and local police and public safety organizations for use only in life threatening situations, as a condition of granting Remington's request for waiver.

Respectfully Submitted,

/s/ Jim Lamoureux

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