



National Cable & Telecommunications Association
25 Massachusetts Avenue, NW – Suite 100
Washington, DC 20001
(202) 222-2300

www.ncta.com

Daniel L. Brenner
Senior Vice President
Law & Regulatory Policy

(202) 222-2445
(202) 222-2448 Fax

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

Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186 and Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GG\Hz Band, ET Docket No. 02-380

Dear Ms. Dortch:

The National Cable & Telecommunications Association (“NCTA”) wishes to focus the Commission’s attention on the significant potential for harmful interference to television receivers and home wiring connected to cable, and to cable headends in rural communities, from current proposals for unlicensed and licensed use of the spectrum in the broadcast TV “white spaces.” We continue to support efforts to open up additional spectrum for the delivery of new wireless communications but it is important that the Commission not lose sight of the over 67 million cable viewers who can also be affected by the outcome of this proceeding.

Of the various proposals and *ex partes* filed in this proceeding over the past year, none address the implications of TV band devices operating on the same frequencies used by cable. And, in particular, none address the potential disruption of customer viewing of cable programming.¹ This inattention has persevered despite detailed filings by NCTA demonstrating the high likelihood that unlicensed TV band devices, as currently proposed, will interfere with cable service – and despite the Commission’s *own* findings in lab tests a year ago confirming the serious risks of “direct pickup” (DPU) interference to cable-ready DTV receivers.² And now

¹ See e.g., *ex parte* filings in ET Docket Nos. 04-186, 02-380 by Dell, Inc., Google, Inc., Hewlett-Packard Co., Microsoft Corp., Palm, Inc., Philips Electronics North America Corp., and TDK Corp (“the White Spaces Coalition”) (March 18, 2008, June 17, 2008, July 11, 2008); Google (March 21, 2008, July 18, 2008); Microsoft and Philips Electronics (March 21, 2008); FiberTower Corporation and Rural Telecommunications Group, Inc. (RTG) (October 2, 2007); FiberTower, RTG, Sprint Nextel and COMPTel (June 25, 2008, July 24, 2008); FiberTower, RTG, Sprint Nextel, T-Mobile and National Telecommunications Cooperative Association (March 31, 2008); CTIA (March 25, 2008, June 19, 2008); COMPTel (May 9, 2008).

² *Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in 3 GG\Hz Band, ET Docket No. 02-380*, NCTA Comments and Reply Comments, filed November 30, 2004, January 31, 2007, March 2, 2007, April 30, 2007, August 15, 2007; NCTA *ex parte* filings (August 1, 2008, July 16, 2008). See “Direct Pickup Interference Tests of Three Consumer Digital Cable Television Receivers Available in 2005,” FCC Office of Engineering and Technology Laboratory, released July 31, 2007 (“Direct Pickup Report”); “Analysis of the FCC Laboratory’s Report on

early reports of Commission field tests further demonstrate that the risk to cable consumers is very real.

As NCTA has pointed out throughout this proceeding, cable television systems have no “white spaces.” Cable systems use *all* of the channels in the broadcast television band for the delivery of programming and other services to their customers. Unlike terrestrial broadcasting, the lack of vacant channels on cable poses unique risks of interference to television viewing on *any* channel where high-powered TV band devices operate nearby. As the Commission’s Laboratory and NCTA’s technical analyses have shown, unlicensed devices operating as low as 4.3 mW (6.3 dBm) can cause harmful interference to cable DTV reception at a distance of 2 meters.³ Yet the unlicensed TV band devices currently under consideration operate at 100 mW (+20 dBm) – more than 20 times the power that has been shown to cause interference to television receivers on both analog and digital signals. Television receivers, both analog and digital, are simply incapable, as the FCC’s tests have shown, of shielding the TV picture from such interference.

To put this in perspective, every time a consumer in a single family home uses a personal/portable TV band device as currently proposed, its signal output will interfere with cable services. For example, a family member using a TV band device in one room for home networking could foreclose another family member from watching a particular TV channel in another room. The affected channel would go blank or be seriously degraded. The idea that a consumer could simply put more distance between the device and the television set is not a solution. As our studies have shown, even in a single family home, the distance that the consumer would have to maintain between the device and the TV receiver to ensure non-interference is impractical.⁴

This problem is more severe in apartment buildings and other multi-dwelling units where people share common walls. One neighbor could subject another neighbor to a degraded TV picture by operating a device in an adjacent apartment. The neighbor experiencing the

Direct Pickup Interference Testing,” David Large Consultants, Inc., attached to NCTA Comments, August 15, 2007; NCTA Reply Comments, filed March 2, 2007, n. 2 (using 0 dBi unlicensed device antenna gain and scaled to the distances used in the FCC tests); *see also* “The Potential Adverse Effects of Unlicensed Operation of New Devices in TV Broadcast Bands on Cable Customers’ Reception of Cable Service,” David Large Consultants, Inc., Appendix I. In addition to DTV receiver interference, the Commission should take into account that approximately 120 million analog television sets (and approximately 93.9 million VCRs) are in cable households today. Data from SNL Kagan, 1Q 2008 and cable MSO industry benchmarks (online).

³ *See* “Direct Pickup Report” at iii, citing test results concluding that unlicensed devices operating as low as “6.3 dBm can cause interference to cable DTV reception at a distance of 2 meters.” The current proposal calls for a 100 mW power level combined with the 6 dBi antenna. In January 2007, the White Spaces Coalition proposed reducing the antenna gain to 0 dBi but our technical analysis showed that lowering the antenna gain to 0 dBi will not solve the DPU problem. Moreover, the distance that would be required to avoid interference by separating the device and the receiver is not practical, particularly in light of multi-dwelling buildings. White Spaces Coalition Comments, ET Docket No. 04-186, 02-380, filed January 31, 2007; NCTA Reply Comments, March 2, 2007. Similarly, the White Spaces Coalition’s proposal to preclude the device from operating on channels 2 through 20, while helpful, does not address the power output issue.

⁴ *See e.g.*, NCTA Comments, ET Docket No. 04-186, January 31, 2007, and Large Consultants technical analysis appended to this filing; *see also* FCC Direct Pickup Report.

interference would have no control over this situation, even assuming the location of the device can be identified in the first place.

In addition to the problem of direct pickup interference to television receivers, the proposed unlicensed TV band devices pose a significant threat to cable's reception of distant over-the-air television programming at headends. Indeed, cable headends are more susceptible to interference from TV band devices given the fragile nature of the distant broadcast station's signal at the headend receive site. Unlicensed devices operating within the narrow beamwidth of the headend's off-air reception of the distant station can occur at signal field strengths much lower than that required to cause DPU interference in the home. The likelihood of interference to distant broadcast stations received at the headend involves a complex function of field strength, antenna configuration and terrain considerations. But in every case where interference occurs, the broadcast programming will be wiped out for the entire community served by that cable system.

As the Commission considers unlicensed use of the TV white spaces, it should also be aware that proposed licensed, fixed uses of the spectrum present far greater risks of harmful interference to cable customers.⁵ FiberTower Corporation and the Rural Telecommunications Group propose installing fixed antennas with an effective transmit power of over 3 kW (+65 dBm) in rural communities. And they have proposed transmitting at this power level on each polarity on the antenna, effectively doubling the per-channel power to over 6 kW (+68 dBm) – over one million times the effective power of devices that caused interference in the Commission's lab tests. Under this proposal, for example, consumers' cable-ready television sets would be adversely affected from distances as far as three miles away.

Like the proponents of white spaces services, we too want consumers to be the winners in this proceeding. As it stands now, this will not happen. The proposals for unlicensed, personal and portable devices and for fixed, licensed use of the TV bands have the potential to seriously degrade service for cable television viewers. Rather than spawning innovative services with no harm to others, as white spaces proponents have touted, the operation of TV band devices could only confuse consumers and undermine existing innovative cable services.

The Commission's goal in this proceeding is to allow the operation of TV band devices in the broadcast television spectrum where such equipment will not cause harmful interference to TV and other authorized services. This objective cannot be met unless proponents of such devices and advocates of alternative licensed uses of the spectrum address and then take steps to ameliorate cable's interference concerns. The cable industry has invested more than \$130 billion since 1996 to deploy advanced digital technology that has transformed the delivery of video programming and access to high speed Internet service and competitive telephone service. The industry supports the introduction of wireless communications devices that may bring new broadband services to the marketplace. But they must coexist effectively with existing communications services if the public is to enjoy the benefits of all broadband services. The proposals currently on the table do not meet this important policy goal.

⁵ "Optimizing the TV Bands White Spaces: A Licensed, Fixed-Use Model for Interference-Free Television and Increased Broadband Deployment in Rural and Urban Areas," *Ex Parte* filings by FiberTower Corporation and Rural Telecommunications Group, Inc., ET Docket Nos. 04-186, 02-380, filed October 2, 2007, June 25, 2008.

The following is an overview of the problems with the current proposals – reinforcing what we have stated to date in numerous filings: TV white spaces devices, as currently proposed, can and will cause harmful interference to cable services.

Interference to TV Receivers

As discussed above, the evidence has shown that television receivers, both analog and digital, and VCRs directly connected to cable simply do not have the shielding necessary to guard against signal ingress from near-field personal/portable devices radiating at the 100 mW level. To address this concern, NCTA advocates, among other things, reducing the power output of personal/portable devices to a maximum of 10 mW (which, as noted above, FCC tests have shown may still be too high) and prohibiting their operation on VHF channels, particularly channels 2 – 4 which would preserve a cable operator’s ability to cure interference that may still occur through a well-shielded set top converter. Nothing else has been put forth by any party to address the output power concern.

Moreover, apart from insufficient TV receiver shielding, Motorola submitted a technical analysis demonstrating that even customer-owned home wiring, splitters and connectors may be a potential source of DPU interference to cable viewing if unlicensed devices with high output power operate in close proximity to this equipment.⁶ As this is independent of television receiver performance, this type of potential interference is particularly alarming as it could affect *all* services on the cable system – video, high-speed data and voice. This critical issue should be taken into consideration by the Commission as well.

Recent press stories about the Commission’s field tests reported that prototype devices had interfered with cable television reception in the residential test sites.⁷ NCTA’s observer, Jeffrey Krauss, witnessed the tests, along with representatives from the White Spaces Coalition, broadcast industry and other interested parties. He observed considerable direct pickup interference to the cable-ready television sets.⁸ Another observer, Edmond Thomas, representing the White Spaces Coalition, conceded that cable interference is “something that has to be understood” and “needs to be looked at.”⁹ Similarly, Steve Sharkey, Motorola’s observer, acknowledged that field tests at the two residences used by the FCC showed interference risks to cable reception, noting “it’s an issue that’s got to be looked at.”¹⁰

Given the mounting – and uncontroverted – evidence of cable interference problems, it is well past time for the proponents of unlicensed devices to address cable DPU interference.

⁶ Motorola *ex parte* presentation, ET Docket No. 04-186, 02-380, filed December 7, 2007.

⁷ Communications Daily, July 28, 2008 at 5 (“a potential red flag arose at the first home, in Ellicott City, Md., when interference came up between a DTV sensor made by Adaptrum and the resident’s cable TV system”).

⁸ *Id.* at 7.

⁹ *Id.*

¹⁰ Communications Daily, August 8, 2008 at 3. *See also* Association of Maximum Service Television, Inc. (MSTV) *ex parte*, ET Docket No. 04-186, 02-380, filed August 22, 2008 (noting Bruce Franca’s observations “that the field tests raise cable interference issues and confirm OET’s earlier testing in this area”).

Interference to Headends

A second problem, also virtually ignored by proponents of TV band devices, is the high risk of interference to rural cable headend antenna reception. Cable systems in rural communities often rely on tower-mounted, high gain directional antennas to receive broadcast signals from distant transmitters, and thus many of these headend sites are outside the stations' predicted Grade B contours (or digital contours as of February 18, 2008 for full-power broadcast stations). The Commission proposes to restrict operation of personal/portable devices only inside the Grade B contour. In many cases, the broadcast stations at issue here are over 100 miles from the cable headend, and given the distance, the signal received at the cable headend is very weak. A TV band device operating within this beamwidth could interfere with the weak broadcast signal received by the cable headend. Indeed, even devices that transmit on adjacent channels within the beamwidth of headend receiving antennas could cause interference for a considerable distance.

We await the Commission's final field test results. But it has not been shown that current signal sensing technology is capable of reliably detecting the availability of clear channels for unlicensed device transmission.¹¹ Given the variability of signal strengths in rural locations, signal sensing would need to be combined with some type of auto-locate feature, such as GPS or equivalent technology, in order to protect cable headends. With this approach, the geographical area that would need to be protected for each channel received would be a function of the contour of the cable headend receive antenna pattern, the strength of the desired signals, and the effective power of the proposed white spaces transmitting devices. Thus, signal sensing would have to work hand-in-hand with a reliable database containing information on eligible channels as a function of location.

We still urge the Commission, therefore, to require spectrum coordination with headend operations outside the Grade B boundary. Such coordination is also essential before TV band devices are permitted to operate on channels adjacent to those being used to receive distant broadcast signals at cable headends. Otherwise, consumers in rural and other communities could be deprived unnecessarily of diverse programming from distant broadcast stations.

Interference from Proposed Fixed, Licensed Use

In addition to pending proposals for unlicensed use of the TV broadcast spectrum, several parties have urged the Commission to adopt a licensed, fixed use approach without addressing cable's interference concerns.¹² In particular, FiberTower Corporation and the Rural Telecommunications Group, Inc., supported by Sprint Nextel Corporation, T-Mobile and COMPTTEL, are seeking authorization to operate a licensed, fixed use model to deploy additional wireless backhaul facilities ("FiberTower proposal"). As discussed in NCTA's August 1, 2008 *ex parte* filing, the FiberTower proposal, as currently set forth, would have a deleterious effect

¹¹ See "Initial Evaluation of the Performance of Prototype TV-Band White Spaces Devices," FCC Office of Engineering and Technology Laboratory report, released July 31, 2007; NCTA Comments and Reply Comments (January 31, 2007, March 2, 2007, April 30, 2007).

¹² *Id.* See *e.g.* *ex parte* filings by Sprint Nextel, T-Mobile (January 3, 2007); FiberTower, RTG, Sprint Nextel, T-Mobile and NTCA (March 31, 2008); COMPTTEL (May 9, 2008).

on cable systems.¹³ The proposed transmit power is of such a magnitude above what a cable system could tolerate without causing harmful direct pickup or headend reception interference that it would have to be dramatically reduced to avoid such interference.

A technical analysis by Large Consultants showed that in order to avoid direct pickup interference to cable homes, the field strength from FiberTower's proposed transmitters should not exceed +99 dB μ V/m at any point within the service area of any cable system.¹⁴ Moreover, the only way the high powered transmitters proposed by FiberTower can operate without causing destructive interference to cable systems who receive off-air signals through use of antennas would be by coordinating with every potentially-affected cable television receive location. The level of DTV signals received at headends (as well as antenna configurations and local geographic features) varies widely, making it impractical to formulate any standard protection distances that would adequately protect cable operations, but not be unduly restrictive of the proposed new transmitters. In many cases, the distance over which destructive interference to headend signal reception will occur is limited only by line-of-sight considerations. But in those communities where such headend reception interference occurs, consumers will lose access to broadcast programming.

FiberTower's high-power transmitter proposal so far exceeds acceptable field strength for non-interference to the services of existing cable subscribers that absent some demonstration that output power could be dramatically reduced (and a mechanism for protecting over-the-air reception at cable headends deployed), its fixed use proposal should not be approved as an alternative use of the TV band spectrum.

In sum, if the Commission proceeds with authorizing unlicensed personal/portable devices, appropriate technical and operational rules are necessary to avoid the high probability of both near-field interference to television receivers and fringe-area headend reception. As noted above, the minimum technical parameters to protect against interference to cable operations include capping the power output of personal/portable devices at 10 mW and prohibiting their operation on VHF channels, particularly low-VHF channels.¹⁵

¹³ NCTA *ex parte*, filed August 1, 2008, submitting technical analysis by David Large Consultants.

¹⁴ The technical analysis submitted in NCTA's August 1, 2008 *ex parte* set the maximum transmitter field strength at +101 dB μ V/m. However, this did not take into account the lower interference threshold for fields in the vicinity of a receiver receiving digital cable signals, nor did it allow for the attenuation of the interfering signal through the external wall of a home, which is estimated to be approximately 5 dB. Taking both of these factors into account, the revised field strength necessary to avoid interference is +99 dB μ V/m. Attached for the record is the revised paper with the adjusted figures.

¹⁵ See summary of technical parameters attached. With respect to fixed devices, the rules should restrict their operation to at least 400 feet from external walls of residential buildings, assuming UHF-only operation (greater distances would be required if any VHF transmissions were allowed).

We urge the Commission to take full account of the unique hazards to cable as it moves forward in the “white spaces” proceeding. Authorization of unlicensed personal/portable TV band devices or fixed licensed uses should not proceed until there is a solution to cable interference. We look forward to the opportunity to fully comment on the Commission’s field tests when the results are published.

Sincerely,

/s/ Daniel L. Brenner

Daniel L. Brenner
Loretta P. Polk

cc: Michelle Carey
Charles Mathias
Rick Chesson
Bruce Gottlieb
Renee Crittendon
Rudy Brioché
Wayne Leighton
Amy Blankenship
Angela Giancarlo
Rosemary Harold
Julius Knapp
Alan Stillwell
Ira Keltz

SUMMARY OF NCTA's TECHNICAL PARAMETERS FOR UNLICENSED TV BAND DEVICES

If the Commission proceeds with authorizing unlicensed TV band devices, it should incorporate the following requirements in its technical rules to ensure that such devices do not interfere with cable's delivery of high quality programming and services to its customers:

- 1) Restrict the operation of portable devices to a maximum of 10 mW and prohibit transmissions in the VHF channels given the high probability of direct pickup interference to TV receivers.

This is based on analyses of the potential for direct pickup ("DPU") interference which establish inadequate shielding of television receivers ("Direct Pickup Interference Tests of Three Consumer Digital Cable Television Receivers Available in 2005," FCC Office of Engineering and Technology Laboratory, July 31, 2007; studies by David Large Consultants, Inc.)

- 2) Prohibit operations, at a minimum, on channels 2- 4.

This preserves cable's ability to solve DPU interference when it arises, through use of external, well-shielded set top converters. Unlike the over-the-air situation, without the prohibition, there is no guarantee of an available "unoccupied" low-VHF channel for the converter to send signals to the receiver.

- 3) Restrict the operation of fixed devices to at least 400 feet from the external walls of residential buildings (absent a special showing that greater building attenuation justifies closer spacing), assuming UHF-only operation (greater distances would be required if any VHF transmissions were allowed). The Large analysis supports this distance requirement in order to avoid DPU from more powerful fixed devices.

- 4) Prohibit operation of fixed devices in VHF channels.

The Large analyses show that because of the increased potential for DPU interference and reduced path loss at lower frequencies which requires very long distances between fixed devices and the cable headend (even when not in the primary beamwidth of receiving antennas), it will be very difficult to protect reception or coordinate with fixed unlicensed VHF transmitters.

- 5) Require spectrum coordination before operation of portable devices on channels adjacent to those being received at headends.

The Large analyses show that portable devices have the potential to cause interference to headend reception, and thus their operation should be restricted within the Grade B contour and coordinated with headends outside the Grade B boundary.

- 6) Of the suggested methods by which fixed and portable devices might automatically determine channel availability, it appears that auto-location (GPS or equivalent), combined with regular access to a reliable database containing geographically-indexed lists of available channels, is the best way to provide the flexibility and reliability required to protect headend reception (without unnecessarily restricting the operation of unlicensed devices).

REVISED COMMENTS ON EX PARTE FILING OF FIBER TOWER AND RTC

David Large

August 26, 2008

On October 2, 2007 FiberTower Corporation and the Rural Telecommunications Group, Inc. (hereinafter “FiberTower”) jointly filed *ex parte* comments with the FCC in the White Spaces proceeding in which they suggested that the Commission allow only licensed devices to operate in unused over-air broadcast television channels which are not in local use (“white spaces”).¹

Their proposal included specific technical parameters that, briefly, would permit much higher effective isotropic radiated power (EIRP) than proposed originally by the FCC, but that also included several measures that they suggested would minimize interference, including:

- Cross-polarization relative to broadcast stations (under certain circumstances),
- Fixed-only operation,
- No co-channel or adjacent channel operation within any stations’ protected contour,
- Restricted co-channel and adjacent channel operation in the area between the protected contour boundary and a calculated line-of-sight distance beyond that contour, and
- Operation restricted to UHF television channels 14-35 and 39-51.

On June 25, 2008 a subsequent *ex parte* letter was filed on behalf of the same parties, plus Comptel and Sprint Nextel Corporation.² This new proposal made certain changes to the earlier proposal, including:

- Some reduction of effective radiated power levels within urban counties.
- Protection for translator, low power and booster stations would be extended to include stations which were operational, had received a construction permit, or for which a permit had been filed, by one year after the DTV transition date.
- Deletion of the originally-proposed use of cross-polarization to reduce interference to reception of broadcast stations -- replaced by a provision specifically permitting the use of both polarizations on any permitted channel.
- An effective 3 dB increase in the total effective radiated power per channel by allowing transmission on both polarities at the full allowable power.

Of particular note, the intent of the proposed rules is to offer protection only to “broadcasters, wireless microphone users, medical devices, radio astronomy, TV studio transmitter and relay links, and pre-existing fixed licensed operations.” No concern is

¹ *Optimizing the TV Bands White Spaces: A Licensed, Fixed-Use Model for Interference-Free Television and Increased Broadband Deployment in Rural and Urban Areas*, white paper submitted in at *ex parte* presentation to the FCC on October 2, 2007 with regard to ET Dockets 04-186 and 02-380 by FiberTower Corporation and Rural Telecommunications Group, Inc.

² Ex Parte filing of Comptel, FiberTower Corporation, Rural Telecommunications Group, Inc., and Sprint Nextel Corporation, dated June 25, 2008.

expressed for the potential of direct pickup (DPU) interference to cable television subscribers, or for potential interference to reception of signals at rural headends of cable systems, despite these issues having been previously raised in these proceedings and despite the fact that the cable television industry serves over one half of the television households in the US.

These Comments are my assessment of the potential for interference to the operations of cable television systems and to reception of signals by their customers, should this proposal be adopted, as well as possible mitigating measures that would reduce the probability of such interference. My analysis will include the potential for direct pickup interference (DPU), in which interfering signals are directly introduced into the internal wiring of television receivers, and interference with reception of over-air broadcast signals by cable headends.

As detailed below, should the FCC approve FiberTower's proposal (or some similar proposal) ensuring a reasonable degree of protection for services delivered by cable television operators will require two specific protection measures beyond those proposed:

A) Measurements to ensure that field strengths in the service area of any cable television operator are no higher than +99 dB μ V/m on any television channel to protect against signals leaking into the wiring of subscribers' television receivers.

B) Coordination with cable television operators who may be operating "headends" where over-air television signals are received and processed for distribution to their customers, to ensure against interference to the channels received. Because of the wide variety of equipment configurations and field strengths received, no universally-applicable "safe" interfering signal strengths can be specified, but in general they will be much lower than the levels necessary to ensure against direct pickup interference (but with coordination required only on the specific channels being received at each location.) In the extreme case of an interfering transmitter located in the primary beamwidth of the headend receiving antenna, co-polarized with the off-air signal, and minimally-usable off-air television signal strength, the maximum tolerable signal strength could be lower than +19 dB μ V/m (Table 1 below).

DIRECT PICKUP INTERFERENCE (DPU)

Direct pickup interference is due to the imperfect shielding of consumer-owned television receivers. The FCC specifies both the characteristics of the signals cable operators deliver to their customers' equipment and, under some circumstances, the minimum shielding effectiveness of consumer-owned television receiving equipment. Thus DPU interference is not under the effective control of cable systems. Nevertheless, the result of that interference affects cable's customers directly, and the burden of dealing with the resultant complaints falls directly on operators.

In my earlier analyses³ I calculated that an external field strength of +94 dB μ V/m in the vicinity of a digital television receiver whose shielding met the requirements of §15.118 would be the maximum that could be tolerated in the presence of a cable television signal whose strength and quality met the FCC's requirements on cable operators for digital signal delivery.⁴

I also calculated that a field strength of +101 dB μ V/m would be the maximum that could be tolerated by an analog television receiver with similar shielding effectiveness and receiving the minimum analog signal strength and quality specified in 76.605(a), but further noted that tests conducted on a sample of production receivers showed that this shielding requirement was not commonly met on VHF channels and that much lower field strengths, in fact, were sufficient to cause degraded reception.⁵

In order to calculate the maximum tolerable signal level outside each subscriber's dwelling, I estimated external wall attenuation to be 5 dB. Thus, the maximum safe external field strength to ensure a lack of DPU interference to customers is +99 dB μ V/m.

These calculations were essentially verified with regard to digital receiver direct pickup (DPU) interference by the FCC's Office of Engineering and Technology.⁶ Based upon limited preliminary tests of three digital receivers which were connected to a broadband service provider, they found that transmitted signal levels as low as +15.3 dBm EIRP caused destructive interference to a receiver located on the other side of a wall, with a total spacing between transmitting antenna and receiver of 10 meters (about 33 feet). When my calculated results are extrapolated to the distance used in the FCC tests, my calculations and the FCC's results differ by only about one decibel.

FiberTower has proposed using EIRP levels as high as +35 dBW in rural counties⁷ (3.162 kW or +65 dBm) – approximately 100,000 times higher power level than that found to cause destructive interference in the OET tests. Furthermore, they have proposing transmitting at this power level on each polarity, effectively doubling the per-channel power to 6.324 kW, or +38 dBW. That is particularly important to DPU interference potential, as the circuitry within a television receiver cannot be expected to have any significant polarity sensitivity. As shown in Figure 1, below, if that level of power from an externally-mounted antenna were directed towards a television receiver located within

³ "The Potential Adverse Effects of Unlicensed Operation of New Devices in TV Broadband Bands on Cable Customers' Reception of Cable Service," submitted as Appendix I to the January 31, 2007 *Comments of the National Cable & Telecommunications Association* in the FCC's White Spaces proceeding, ET Docket 04-186 and ET Docket 02-380.

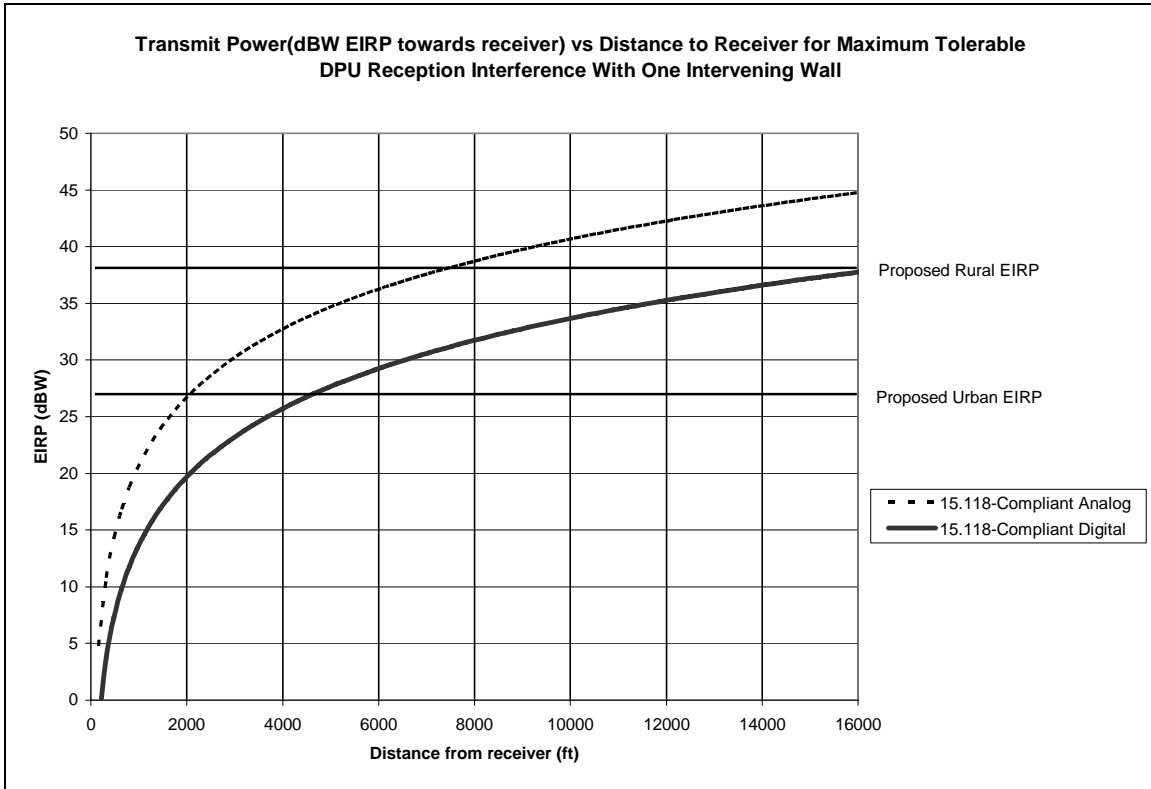
⁴ These requirements are contained in ANSI/SCTE 40 2004, which is included by reference in the FCC's rules for cable operators at §76.640(b)(1)(i).

⁵ *Consumer Premises Equipment Performance and Compatibility Testing*, CableLabs, 1993, submitted to the Commission as an attachment to the January 1994 Comments of Joint Filers in ET Docket 93-7, FCC No. 93-495.

⁶ "Direct-Pickup Interference Tests of Three Consumer Digital Cable Television Receivers Available in 2005," OET Report FCC/OET 07-TR-1005.

⁷ FiberTower white paper, Appendix A, item 3.

a home with one intervening wall, the DPU interference distance would be about three miles.



In urban counties, the proposed maximum EIRP is +24 dBW, or 251 watts per polarity.⁸ At that power level, the distance over which unacceptable interference can be expected to occur is reduced to about 4500 feet – still over three-quarters of a mile. Furthermore, none of the mitigation measures proposed by FiberTower to reduce interference with off-air reception would be effective in reducing the level of DPU interference:

A) **Channel Restrictions and Over-Air Station Protection.** FiberTower has proposed limiting operation to UHF channels 14-35 and 39-51⁹ and, further, protecting Part 73, Subpart E and Subpart J stations by forbidding operation on either the transmitted channel or either adjacent channel of any station within its protected contour.¹⁰ Beyond the Grade B contour limit, operation would be permitted by either:

- Conducting a study to demonstrate that co-channel signal levels everywhere within the protected contour were 15 dB below the protected signals and that adjacent channel signal levels were no more than 26 or 28 dB above the protected signals, mirroring the DTV-to-DTV protection levels of §73.623(c)(2),¹¹ or

⁸ FiberTower June 2008 *ex parte* letter, page 3.

⁹ FiberTower white paper, Appendix A, item 2 and June 25, 2008 *ex parte* filing “Proposed Technical Rules,” at number 3.

¹⁰ June 25 *ex parte* filing “Proposed Technical Rules,” number 6a, first bullet point

¹¹ *ibid*, number 6a, second bullet point

- For antenna heights no greater than 500 feet height above average terrain (HAAT), by positioning co-channel transmitting stations at least 42 miles beyond the Grade B contour limit and adjacent-channel transmitting stations at least 12 miles beyond the Grade B limit. In either of these cases, no study would be required to demonstrate lack of interference.¹²

For low power, translator and booster stations, FiberTower proposes only to not transmit on co-channel or adjacent-channels with an area that comprises the Grade B contour plus an 8-mile buffer outside that area. No interference studies would be required.¹³

As pointed out in previous filings, however, cable operators typically utilize every channel within the bandwidth limitations of their systems and cable subscribers are distributed throughout the country – many well beyond the protected contour boundaries of any broadcast television station. Thus, even though FiberTower proposes some restrictions on certain channels which are utilized in any given community, DPU interference can and will occur on whichever channel they utilize if the field strength in the vicinity of television receivers exceeds the shielding threshold discussed above. Thus, the channel restrictions proposed offer no mitigation with respect to DPU interference, except to the extent that UHF-only operation at least avoids those channels where the CableLabs study cited in our previous paper found receivers least likely to meet the minimum shielding requirements assumed in Figure 1.

B) *Urban County Power Restrictions.* While the power reduction will reduce the distance within which DPU interference is likely by about a factor of about four, that still leaves a large area subject to possible interference, especially given the proposed 25-degree 3-dB transmit antenna beamwidth and unspecified response curve outside that azimuth range.

In summary, the proposed high-power fixed transmitters have a significant potential to cause DPU interference to television receivers within the homes of cable television subscribers at distances of up to approximately three miles from transmitting antennas. This is a dramatically increased risk, when compared with the interference radius of tens of feet for the portable unlicensed devices or hundreds of feet for the fixed unlicensed devices previously proposed by others.

The interference potential can be reduced to the extent that transmitters are restricted to areas located a substantial distance from any cable system subscribers, and utilize antennas with sufficient directivity to focus transmitted energy away from subscriber's homes. Given that the operations proposed are fixed, the only practical way of assuring a lack of DPU interference may be a study similar to that proposed by FiberTower¹⁴ with regard to field strengths within stations' protection contours. Such a study would be required to demonstrate that the field strength does not exceed +99 dB μ V/m at any point within the service area of any franchised cable system.

¹²*ibid.*, number 6a, third bullet point

¹³ *ibid.*, number 6d.

¹⁴ FiberTower's white paper, referenced earlier, at item 5.

INTERFERENCE TO RECEPTION OF OFF-AIR BROADCAST SIGNALS AT CABLE SYSTEM HEADENDS

As pointed out in my earlier study,¹⁵ many cable television headends, where over-air broadcast stations are received and processed for re-distribution to rural communities, are located well beyond the protected contours of the stations received. Given a typical sub-fringe-area antenna configuration and usable received DTV signal level, I calculated the maximum tolerable noise-like interfering field strength, both on- (within the primary beamwidth) and off-axis of the receiving antennas. For the UHF channel range proposed by FiberTower, those results are summarized in the following table (whose derivation is contained in the referenced study):

Table 1: Maximum Tolerable Undesired Field Strengths at Headend Receiving Location

	Field strengths (dB μ V/m) required to produce a -72 dBm desired signal at the processing equipment and maximum allowable interfering signal level to guarantee at least 23 dB D/U	
Channel	14	51
Desired DTV Field Strength	+41.8	+45.1
Maximum Undesired Field Strength (on-axis)	+18.8	+22.1
Maximum Undesired Field Strength (off-axis)	+43.8	+47.1

Note that the minimum usable desired DTV signal strength is about 20 dB below the level at the predicted Grade B contour, but still results in a signal level at the processing equipment input that is 11 dB greater than the sensitivity suggested in the ATSC A/74 standard for consumer digital television receivers.¹⁶ This is a reflection of the receiving situation at many rural cable headends, where tall towers and large, multi-antenna arrays are required to get adequate quality signals for redistribution to customers.

23 dB D/U ratio is equivalent to reducing the fade margin of the receiving process from 8 dB to 5 dB for that DTV station and is felt to be a reasonable accommodation to the new service while retaining usable performance margins for the cable operator.

A simple field strength analysis shows that, even if one of the proposed FiberTower transmitters were located off-axis of the receiving antenna, but were configured so that the headend was within the transmitting antenna's primary beamwidth, the required protection distance would be line-of-sight limited since, at a distance of 1,000 miles, the field strength from a +35 dBW transmitter (single polarity transmission) is approximately

¹⁵ "The Potential Adverse Effects of Unlicensed Operation of New Devices in TV Broadband Bands on Cable Customers' Reception of Cable Service," cited above.

¹⁶ ATSC Recommended Practice: Receiver Performance Guidelines, document A/74, Advanced Television Systems Committee, 1750 K. Street, NW, Washington, DC 20006

+46 dB μ V/m in free space. In fact, even at the reduced “urban county” proposed transmit level, the interference distance would be line-of-sight limited. DTV-to-DTV mutual interference does not occur at such distances only because the line of sight, and thus useful transmission distance from each transmitter, is limited by the earth’s curvature and intervening geographic features.

FiberTower’s originally-proposed cross-polarization requirement would not have applied to rural receiving locations that are typically located well beyond the protected grade B contour of stations in any case, but if it were applied, would reduce the required protection distance. As an example, if a receive antenna array had an effective polarization sensitivity of 15 dB, the free-space distance in the above example would be reduced from 1,000 miles to about 175 miles – still likely line-of-sight limited.

Based on these factors, the only way the high powered transmitters proposed by FiberTower can operate without causing destructive interference to cable systems who receive off-air signals through use of antennas would be by coordination with every potentially-affected cable television receive location. The level of as-received DTV signals at headends, as well as antenna configurations and local geographic features, varies widely, so that it is impractical to formulate any standard protection distances that would be adequately protective of cable operations, but not be unduly restrictive of the proposed new transmitters.