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BY ELECTRONIC FILING

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, D.C. 20554

**Re: *Ex Parte* Filing by FiberTower Corporation and
Rural Telecommunications Group, Inc.
ET Docket Nos. 04-186, 02-380**

Dear Ms. Dortch:

FiberTower Corporation and the Rural Telecommunications Group, Inc. hereby submit the attached white paper, *Optimizing the TV Bands White Spaces: A Licensed, Fixed-Use Model for Interference-Free Television and Increased Broadband Deployment in Rural and Urban Areas*, as part of the record in the above-captioned proceeding. By using a licensed, fixed-use model for the TV bands white spaces, the Commission will encourage and support commercial and public safety wireless broadband deployment through facilitating much needed additional wireless backhaul facilities. Moreover, the model set forth in the white paper will encourage the most efficient use of the TV bands white spaces, address the interference concerns raised in this proceeding, and provide accountability and regulatory certainty to stakeholders.

Please contact me directly with any questions.

Respectfully Submitted,

/s/ Michele C. Farquhar

Michele C. Farquhar
Special Counsel to FiberTower Corporation and
Rural Telecommunications Group, Inc.

Enclosure

White Paper
ET Docket Nos. 04-186, 02-380

OPTIMIZING THE TV BANDS WHITE SPACES:

**A Licensed, Fixed-Use Model for Interference-Free Television and
Increased Broadband Deployment in Rural and Urban Areas**

Introduction

The Federal Communications Commission’s ongoing TV “white spaces” proceeding presents a rare opportunity for the Commission. The unused spectrum in the TV bands has superior propagation characteristics that can be extremely useful in the provision of fixed wireless services, particularly in rural areas. Although several incumbent users, including television broadcasters, wireless microphone providers, medical telemetry, and private land mobile radio service (“PLMRS”) providers, will remain in the TV bands, new licensed fixed wireless services can operate there without causing harmful interference to the existing users. Thus, the proponents¹ note that this proceeding affords the Commission the opportunity to fulfill two of the most important policy mandates set forth in the Communications Act: (i) the mandate to facilitate the deployment of new applications and services;² and (2) the mandate to ensure that existing services are protected adequately from harmful interference.³ Although these two policy

¹ This white paper is filed by the Rural Telecommunications Group, Inc. (“RTG”) and FiberTower Corporation (“FiberTower”). RTG is a Section 501(c)(6) trade association dedicated to promoting wireless opportunities for rural telecommunications companies through advocacy and education; RTG members are small, rural businesses serving or seeking to serve secondary, tertiary and rural markets that have joined together to speed delivery of new, efficient, and innovative telecommunications technologies to the populations of remote and underserved sections of the country. FiberTower is a leader in delivering fixed wireless backhaul and access services to mobile carriers and the enterprise and government markets, with extensive wide-area licensed spectrum assets at 24 GHz and 39 GHz, and a footprint covering much of the U.S. population. FiberTower also holds over 3,000 point-to-point fixed wireless licenses in the millimeter wave bands.

² See 47 C.F.R. § 157(a) (establishing the policy of the United States “to encourage the provision of new technologies and services to the public”); *id.* § 303(g) (ordering the Commission to “[s]tudy new uses for radio . . . and generally encourage the larger and more effective use of radio in the public interest”); see also *id.* § 157 nt. (requiring the Commission to “encourage the deployment . . . of advanced telecommunications capability”).

³ See *id.* § 302.

mandates can some times be in tension with one another, they can be reconciled here in a manner that holds great promise for the TV bands.

This proceeding also affords the Commission the opportunity to take a significant step towards achieving its Broadband Strategic Goal, ensuring that “[a]ll Americans should have affordable access to robust and reliable broadband products and services.”⁴ One of the most difficult challenges in meeting this goal is finding the technology and platform to deliver broadband services to consumers over large geographic areas in a cost-effective and competitive manner. The TV white space spectrum provides a unique opportunity for existing and new service providers to access fixed service spectrum that provides exceptional coverage capabilities and for which existing equipment is readily available. In addition, this spectrum could be used to provide valuable backhaul and other support services.

The Commission also has the opportunity to recoup the value of this spectrum for the American public through an auction of the exclusive rights to use the white spaces spectrum. This spectrum is extremely valuable due in large part to its excellent propagation characteristics.⁵ Although much of the available spectrum is located outside of urban areas, there is a large amount of spectrum available in many areas.

The Commission’s cautious approach thus far towards authorizing the unused portions of the TV bands has struck an appropriate balance between the need to protect incumbent users and the need for more extensive use of the bands. This spectrum is particularly well-suited for fixed services, which can facilitate much-needed wireless backhaul services in both urban and rural

⁴ “FCC Strategic Goals: Broadband,” at www.fcc.gov/broadband.

⁵ Part of the “white spaces” spectrum is adjacent to the 700 MHz band that the Commission is planning to auction as part of the digital television transition. The Commission has proposed a minimum reserve price of more than \$10 billion for the 62 megahertz of 700 MHz spectrum that will be auctioned. *See Auction of 700 MHz Band Licenses Scheduled for January 16, 2008*, Public Notice, DA 07-3415, released August 17, 2007.

areas. Moreover, licensing this spectrum on an exclusive basis, using spectrum auctions or the current license fee approach, would help alleviate interference concerns while serving important public interest goals. By limiting new services in the TV bands to those that are both fixed and licensed, the Commission would avoid having to rely upon ineffective and unproven technologies to avoid degrading incumbent operations. Moreover, under a fixed, licensed regime, the Commission could and should take additional steps to avoid harmful interference to incumbent operations by reserving certain channels for particular incumbent uses (such as for wireless microphone and medical telemetry operations) and prohibiting new fixed operations on those particular channels. These steps will ensure that operations by new licensees will not cause interference to incumbent operations already transmitting in the TV bands. Incumbent users will not be adequately protected from harmful interference, however, if mobile or portable use is allowed in the bands.

The importance of services already operating in the TV bands justifies a cautious approach to authorizing new services in the bands. The good news, however, is that such an approach can produce significant new benefits and help to promote the Commission's broadband policy agenda. FiberTower Corporation ("FiberTower") and the Rural Telecommunications Group, Inc. ("RTG") believe that the Commission should continue this cautious, balanced approach as it reaches a final decision on the use of the TV bands. In particular, the Commission should:

- Authorize the TV bands for new licensed fixed services to encourage and support commercial and public safety wireless broadband deployment and provide for additional wireless backhaul facilities;

- License the TV bands for fixed use on an exclusive basis – but identify some TV band channels as unavailable for new fixed services – to encourage the most efficient use of the spectrum, address the interference concerns raised in this proceeding, and provide accountability and regulatory certainty to stakeholders;⁶ and
- Identify a specific “bundle of rights” and use a competitive auction or the current license fee approach to disseminate licenses in the TV bands to further reduce the potential for interference and ensure that the public is compensated appropriately for the use of this valuable spectrum.

I. THE TV BAND WHITE SPACES SHOULD BE LICENSED FOR FIXED SERVICES.

At the end of the digital television transition on February 17, 2009, there will be a number of channels in the TV bands⁷ that will remain unused by television broadcasters.⁸ On May 13, 2004, the Commission proposed to allow fixed and mobile or portable unlicensed operation in these “white spaces” in the TV bands, subject to the unlicensed devices incorporating “smart radio” features, on the unused channels.⁹ In the *2006 Report and Order*, the Commission authorized fixed operations in the TV bands but sought further comment on the use of mobile and portable devices in the bands.¹⁰ It specifically prohibited mobile and portable

⁶ Incumbent use of the TV bands, including “full power” TV broadcasting, low power television (LPTV), wireless microphones, land mobile, TV translators, medical devices, and broadcast auxiliary, would continue. The new use – for fixed wireless operations – would be licensed on an exclusive basis (*i.e.*, to a single entity for a particular frequency or location).

⁷ The TV bands referenced in this white paper include the 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-806 MHz bands.

⁸ See *Unlicensed Operation in the TV Broadcast Bands*, First Report and Order and Further Notice of Proposed Rulemaking, 21 FCC Rcd 12266 ¶ 5 (rel. Oct. 18, 2006) (“*2006 Report and Order*” and “*Further Notice*”).

⁹ See *Unlicensed Operation in the TV Broadcast Bands*, Notice of Proposed Rulemaking, 19 FCC Rcd 10018 (2004).

¹⁰ See *2006 Report and Order* ¶ 2.

devices, however, on TV band channels 14-20 that are used by public safety services.¹¹ It also sought comment on whether it should license the “white spaces” in the TV bands.¹²

The Commission’s decision in the *2006 Report and Order* to authorize new fixed services in the TV bands was an important step in optimizing the use of the TV bands after the DTV transition.¹³ As described below, allowing new fixed services will produce significant benefits, including spurring broadband deployment in rural areas and facilitating wireless backhaul services. These benefits will *not* materialize, however, if the Commission also allows mobile and portable use in the white spaces. Mobile and portable use poses inherently greater interference threats than fixed devices to all incumbent users, and numerous parties in this proceeding have voiced their concerns about such use, as described below, that outline why mobile or portable use is simply impractical. Therefore, the Commission should facilitate further deployment of fixed services in the TV bands and prohibit mobile and portable use.

The Commission’s initial decision to authorize fixed services in the TV bands was strongly supported by the record in this proceeding and the particular characteristics of the TV bands. The Commission noted at the outset of its decision that “it is easier to protect incumbent operations in the TV bands . . . when [new] devices [introduced into the band] are limited to fixed operation.”¹⁴ This is particularly true when the frequencies in use by incumbents differ dramatically from market to market, as with the TV bands. Moreover, mobile and portable devices that take advantage of the superior propagation characteristics of the TV bands would likely pose additional interference risks to incumbent users (including not only television

¹¹ *Id.*

¹² *Id.* ¶ 3.

¹³ *See id.* ¶ 18.

¹⁴ *See id.* ¶ 17.

broadcasters, but wireless microphone users, medical telemetry, and some PLMRS providers as well), both within the same market and in neighboring markets. Fixed services, by contrast, can be structured to avoid these problems. For example, under a fixed-use regime, the Commission and band incumbents would know where all new users were operating, would be better able to ensure that they do not cause harmful interference, and would be able to know who to contact should harmful interference actually occur. In addition, fixed service stations can be engineered so as to avoid causing interference.¹⁵ The Commission has significant experience introducing new fixed services successfully into occupied bands. For example, the Commission allocated the 12 GHz band for fixed MVDDS services after the band had previously been used for digital broadcast satellite services.¹⁶ The Commission has also permitted TV studio transmitter links (“STLs”), TV relay stations, and TV translator relay stations to operate fixed point-to-point on a secondary basis on TV UHF channels 14-69 for many years.¹⁷ Fixed operations can take advantage of available spectrum in an efficient manner while ensuring that incumbent operations are protected from interference.

¹⁵ For example, fixed service operators could limit the deployment of transmitters to locations that are well outside of the coverage area of a TV station. Directional antennas could be installed to ensure that signals are directed away from television receivers that might be tuned to a distant TV station on the same frequency.

¹⁶ *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates; and Applications of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide A Fixed Service in the 12.2-12.7 GHz Band*, First Report and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 4096 (2000). In addition, in 2000, the Commission allocated three spectrum bands to the Wireless Medical Telemetry Services (“WMTS”), including the 608-614 MHz band. *See Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service*, 15 FCC Rcd 11206 (2000). It prohibited at-home and ambulance use of WMTS (effectively prohibiting mobile and portable use except within a health care facility) after commenters raised concerns regarding frequency coordination and harmful interference to incumbent users. *See id.* at 11216-17 ¶¶ 28-31.

¹⁷ *See* 47 C.F.R. § 74.602(h).

New Fixed Services in the TV Bands Will Advance the Commission's Broadband and Competition Policy Goals.

The Commission's authorization of new fixed services in the TV bands not only reflects sound spectrum management, but also promotes important policy objectives. The authorization of new licensed, fixed point-to-point and point-to-multipoint services in the bands could have a substantial, positive impact on broadband deployment. For example, the TV bands are ideal for providing wireless backhaul services in many areas, and can thus be used effectively as a foundational tool for new entrants and existing carriers to construct wireless networks across large regions of the country.¹⁸ Given the propagation characteristics of the band, and the ability of signals to cover long distances, the TV bands are particularly well-suited for use in rural areas.

The rapid, increasing deployment of mobile wireless services has created an urgent need for substantial new wireless backhaul facilities. The number of U.S. wireless customers continues to grow and is now estimated at over 240 million in the U.S.¹⁹ These subscribers made almost two trillion minutes' worth of wireless calls in 2006.²⁰ Wireless carriers are now offering an expanding line of broadband video and data services to complement their existing voice services, and consumers are quickly adopting these services.²¹ To keep pace with this growth,

¹⁸ The amount of white spaces spectrum varies dramatically depending on the location. In general, there is some, though very little, white spaces spectrum available in major urban areas, particularly in the Northeast. However, there are large metropolitan, suburban, and rural areas where white space spectrum exists. That said, numerous swaths exist – particularly in rural areas – where 50 megahertz or more of white space spectrum could be available. In some instances, these areas are near petroleum operations where broadband services are lacking. With limited availability in large portions of heavily populated areas of the country, the TV white space spectrum would not provide a universal answer to service providers's extensive need for backhaul; however, authorizing fixed license uses in this band could augment the other modes of backhaul that are used today, especially for longer distance or lower capacity services (when compared to the shorter distance, higher capacity millimeter wave fixed wireless bands).

¹⁹ See www.ctia.org.

²⁰ See CTIA Semi-Annual Wireless Industry Survey, End-of-Year 2006 Top-Line Survey Results, at 7, available at <http://www.ctia.org/advocacy/research/index.cfm/AID/10316> (Dec. 2006).

²¹ See, e.g., "Mobile Business Data Services to Generate over \$100 Billion by 2012, According to ABI Research," Business Wire (Aug. 1, 2007) (reporting that "[a]ccording to a new report from ABI Research, mobile data

wireless carriers need substantial additional backhaul capacity to handle the increased volume of traffic.²² Otherwise, customers will experience blocked or dropped calls and reduced data transmission speeds.²³

Moreover, the limited supply of backhaul capacity has been stretched further by the Commission's reallocation of significant amounts of spectrum for mobile wireless services. In particular, the Commission's successful Advanced Wireless Services ("AWS") auction in 2006 included 90 MHz of additional spectrum that many carriers plan to use for new services, including broadband video and data services. The upcoming auction of 700 MHz spectrum includes another 62 MHz of spectrum that can be used for mobile broadband services, including a spectrum block designated for a vital public safety-private sector shared infrastructure network with significant nationwide build-out requirements.²⁴ As winning bidders begin deploying new 3G and 4G services in the AWS and 700 MHz bands, their backhaul needs will continue to rise.²⁵ In addition, current and future services in the Wireless Communications Services

applications and services used by business customers will generate over \$100 billion in worldwide revenue by 2012," and quoting principal analyst Dan Shey that "[t]he industry is at the cusp of some phenomenal growth for data applications and services delivered to the handset . . . mobile data services revenues will become 26% of ARPU's by 2012, a 29% compound annual growth rate."); Written Testimony of Barry West, Chief Technology Officer and President, 4G Mobile Broadband, Sprint Nextel Corporation, before the House Subcommittee on Telecommunications and the Internet, April 19, 2007 ("West Testimony," attached at Appendix A), at 3 (noting current consumer interest in "downloading large files, music and mobile TV through mobile broadband connections").

²² See, e.g., West Testimony at 3-4. Carriers also continue to deploy new towers to accommodate customer traffic. The number of cell sites in service grew 6.5% in 2006 to an all-time high of 195,613. See CTIA Semi-Annual Wireless Industry Survey, End-of-Year 2006 Top-Line Survey Results, at 7, available at <http://www.ctia.org/advocacy/research/index.cfm/AID/10316> (Dec. 2006).

²³ See Kelly Hill, "Backhaul Rising," RCR Wireless News (Mar. 29, 2007) (reporting an estimate by Richard Webb, directing analyst for Wireless Infonetics Research Inc., that the wireless backhaul market is projected to reach \$6 billion by 2010 due to customer growth and increased data usage).

²⁴ See *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, WT Docket No. 06-150, Second Report and Order, FCC 07-132 ¶ 3 (rel. Aug. 10, 2007). Public safety users are also facing a critical shortage of wireless backhaul services.

²⁵ See Statement of Commissioner Robert M. McDowell, *Amendment of Part 101 of the Commission's Rules to Modify Antenna Requirements for the 10.7 – 11.7 GHz Band*, Notice of Proposed Rulemaking, 22 FCC Rcd 6057 (2007) (supporting a rulemaking to facilitate microwave backhaul service in the 11 GHz Band, which will allow

(“WCS”), Ancillary Terrestrial Service for Mobile Satellite Services (MSS ATC), AWS H & J Block, AWS 2155-2180 MHz band, 4.9 GHz band and public safety spectrum bands will also require substantial additional backhaul capacity.

The Commission has allocated spectrum below 3 GHz for fixed point-to-point and fixed point-to-multipoint use in the past, but much of that spectrum has been reallocated to other uses (including mobile services), forcing operators of fixed point-to-point and point-to-multipoint services to relocate to higher spectrum bands with different propagation characteristics.²⁶ These millimeter band wireless backhaul solutions provide attractive solutions for shorter distance and high-capacity services. The millimeter bands are not as attractive for providing wireless backhaul services over longer distances or serving lower capacities. Although wireless backhaul spectrum with longer-distance propagation characteristics for fixed services has, until now, been less critical than securing more spectrum for mobile services, the emergence of mobile broadband services is changing that dynamic.²⁷ Because of the increased demand for broadband services in general, there is now a new, greater demand for wireless broadband (among both

wireless backhaul providers “to compete with each other, as well as with landline backhaul providers, on an equal footing; thus increasing competition and lowering costs throughout the entire backhaul market,” and stating that “[t]his is especially important as the consumer acceptance of 3G and 4G high speed data services – such as those envisioned for deployment in the soon-to-be-auctioned 700 MHz band – increases the need for backhaul”). As Commissioner McDowell noted, the capacity constraints are expected to become even more critical as carriers introduce more bandwidth-intensive 4G services.

²⁶ See, e.g., *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, First Report and Order and Third Notice of Proposed Rulemaking, 7 FCC Rcd 6886 (1992) (reallocating 220 MHz of spectrum between 1850 and 2200 MHz, which had previously included only fixed microwave operations, for emerging technologies that include PCS); *Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems*, Second Report and Order, 17 FCC Rcd 23193 (2002) (reallocating the 1710-1755 and 2110-2155 MHz bands for advanced wireless services, portions of which had previously been allocated for fixed microwave operations).

²⁷ See Dan O’Shea, “Backhaul in the Spotlight,” *Telephony Magazine* (Mar. 26, 2007) (quoting Dragonwave (a fixed wireless vendor) Cofounder, Chief Technology Officer and Vice President of Engineering Erik Boch that “[t]he frequencies up to eleven gigahertz are very congested and not good for backhaul, and above thirty-eight gigahertz, the propagation limits start to make it more of a short-haul technology”).

commercial and public safety users), which relies on backhaul capacity for the many new services. The amount of available spectrum below 3 GHz upon which fixed wireless services currently operate, however, remains very low.

Because signals in the TV bands travel long distances relative to signals that transmit in higher bands, new licensees should be able to deploy robust and reliable high-capacity networks with sufficient backhaul capacity at a lower cost than options in other fixed wireless bands or wireline options. In fact, new TV band licensees should be able to provide wireless backhaul services in less time than it would take for an ILEC to extend its facilities. For example, whereas ILECs must dig new trenches or attach new wires to hundreds or thousands of poles to augment backhaul capacity, a wireless backhaul provider only needs to find locations suitable for the siting of network equipment (such as towers, office buildings, or other structures). In addition, relatively low-cost transmitters and antennas are already available for TV STLs, TV relay stations, and TV translator relay stations, and this same equipment could be easily adapted for use by fixed service providers. By making available the means to provide competitive backhaul services (and thereby facilitating lower prices, more innovation and higher service quality), the Commission could promote increased competition, offer alternative ways for commercial service providers to reach their enterprise customers and for public safety users to meet mission-critical objectives, and facilitate the development of wireless as a viable platform for the delivery of such broadband services.

The Commission Should Prohibit Mobile and Portable Applications From Operating in the TV Bands to Prevent Interference to Incumbent Users.

In addition to eviscerating the potential benefits from new fixed services in the bands, the presence of mobile and portable devices would pose a significant threat of interference to

incumbent users. Although the Commission sought comment in the *Further Notice* on the possible use of portable and mobile devices in the TV bands,²⁸ it has already recognized the potential for interference that these devices carry, stating that “[n]on-fixed devices . . . generally pose a greater risk of harmful interference to authorized operations than fixed devices because such devices may have antennas that are less efficient and may be in a less advantageous position for sensing of incumbent transmissions . . . especially given that they will change location, thus making reliable identification of unused frequencies substantially more difficult.”²⁹ The Commission has also noted the difficulty that TV and other incumbent licensees might experience locating a non-fixed device that causes interference because such a device “frequently changes location, whereas a fixed device that causes interference can be located more easily.”³⁰ In addition, as the Commission noted in the *2006 Report & Order*, “the developing IEEE 802.22 standard is . . . at this time . . . limited to fixed point-to-point and point-to-multipoint operations and does not address . . . non-fixed personal/portable . . . devices.”³¹

The record in response to the Commission’s *Further Notice* further validates the dangers of authorizing new portable or mobile uses. A wide range of commenters argue that a strong potential exists for personal/portable devices to cause harmful interference to incumbent operations in the band and that, therefore, these devices should not be allowed.³² By their nature,

²⁸ See, e.g., *2006 Report and Order* ¶¶ 18, 23.

²⁹ *Id.* ¶ 18.

³⁰ *Id.*

³¹ *Id.*

³² See, e.g., Reply Comments of MSTV and NAB to the OET Measurement Report on DTV Receiver Interference Rejection Capabilities in ET Docket No. 04-186 (May 15, 2007) at 3 (“MSTV/NAB OET Measurement Report Reply”); Comments of Shure Incorporated in ET Docket No. 04-186 (Apr. 30, 2007) at 5 (“Shure April 30, 2007 Comments”); Comments of NCTA in ET Docket No. 04-186 (Jan. 31, 2007) at 3; Comments of Qualcomm in ET Docket No. 04-186 (Jan. 31, 2007) at 4 (“QUALCOMM remains highly skeptical that interference from mobile devices that would operate on an unlicensed basis . . . can truly be mitigated through spectrum sensing technology. It is essential that the Commission not act in this proceeding on the basis of supposition, but instead on hard,

portable and mobile devices are capable of being operated from any location, including locations that are very close to TV receivers and other devices used to receive or transmit services that would have to be protected in the band.³³ For these same reasons, the Commission has already prohibited the use of mobile and portable TV band devices on the frequencies used by PLMRS and public safety in these bands, even in geographic areas where these providers do not operate.³⁴

Proponents of mobile and portable devices point to spectrum sensing technology as the panacea for their interference-causing devices, but that technology has not yet developed to the point where portable or mobile operations can be safely authorized in the TV bands. For example, the White Spaces Coalition claims that portable devices that transmit at a maximum output power of 100 mW and apply spectral sensing technology with a detection threshold that is 30 dB below a DTV receiver's threshold of visibility should afford TV broadcasters sufficient protection from harmful interference.³⁵ However, MSTV/NAB disagree.³⁶ MSTV's study shows that "significant co-and adjacent channel interference [to TV operations would occur]

empirical, and reliable test data.") ("Qualcomm 2007 Comments"); Comments of Cox Broadcasting in ET Docket No. 04-186 (Jan. 31, 2007) at 4-5 ("Cox Comments").

³³ See Comments of Shure Incorporated in ET Docket No. 04-186 (Jan. 31, 2007) at 6 (stating that "[p]ersonal/portable devices are, for frequency coordination and sharing purposes, inherently unpredictable") ("Shure January 31, 2007 Comments").

³⁴ See *2006 Report and Order* ¶ 21; see also *id.* at 7.

³⁵ See Comments of the White Spaces Coalition in ET Docket No. 04-186 (April 30, 2007) at 2; see also comments of the White Spaces Coalition in ET Docket No. 04-186 (Jan. 31, 2007) at 4-9.

³⁶ See Joint Comments of the Association for Maximum Service Television, Inc. and the National Association of Broadcasters in ET Docket No. 04-186 (Jan. 31, 2007) ("MSTV/NAB Joint Comments") at 34 ("personal/portable devices . . . are extremely problematic and should not be allowed to operate in the television band because the Commission will be unable to ensure that harmful interference to licensed services does not occur."); see also Letter from Bruce Franca, VP, Policy and Technology, Maximum Service Television, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission at 3 (filed May 31, 2007) (noting that antenna size, height, and location can all have a significant impact on the level of harmful interference created by personal and portable devices operating in the TV bands).

from personal/portable devices operating at 100 mW.”³⁷ Importantly, MSTV/NAB correctly assert that spectral sensing will be ineffective at protecting TV operations because it will not, in their view, adequately protect TV reception, especially in situations where personal and portable devices are operated in close geographic proximity to television sets receiving transmit signals, noting that the signals are weaker and less robust than the military radar signals that are currently being protected, in part, by spectral sensing in the 5 GHz band.³⁸ As MSTV/NAB point out, the OET Measurement Report on DTV Receiver Interference Rejection Capabilities “shows that a 100 mW transmitter operating on the first adjacent channel could cause interference to DTV viewers in 80 to 87% of a TV station’s service area depending on which of the Commission’s tested DTV receivers is used.”³⁹

As MSTV/NAB have pointed out, it is highly questionable whether spectrum sensing technology can protect broadcast signals against interference from mobile and portable devices. Even supporters of portable services in the band question the efficacy of spectral sensing as a way of preventing harmful interference. Motorola, although advocating in favor of the authorization of portable devices, argues that “spectral sensing . . . has not yet been demonstrated to be sufficiently robust as an exclusive means of recognizing and avoiding interference with protected incumbents in the TV band.”⁴⁰ Consumers operating a mobile or portable device in close proximity to a television set (including their own set) may lose their television signal altogether and wonder about the cause of the problem. Those same consumers may not realize

³⁷ MSTV/NAB Joint Comments at 35.

³⁸ *Id.* at 14-15 (pointing out the possibility that portable devices could be operated very close to TV receivers and pointing out that, unlike the military radar currently being protected through Dynamic Frequency Selection in the 5 GHz band, TV receivers are not co-located with TV transmitters).

³⁹ MSTV/NAB OET Measurement Report Reply at 5 (emphasis added).

⁴⁰ Comments of Motorola in ET Docket No. 04-186 (Jan. 31, 2007) at 23.

that it is their own devices that are causing the harmful interference. In rural areas, moreover, the superior propagation characteristics of the TV band spectrum could further increase the likelihood of interference from new mobile or portable users. If the experience with Wi-Fi is any indication, portable or mobile consumer TV band devices could become widely available and widely deployed and used, making it extremely difficult to force the operators of such devices to cease using them when harmful interference to incumbent operations occurs.⁴¹ Critical TV operations, like the Emergency Broadcast System, are too important to increase the risk that they might suffer harmful interference.

Although the White Spaces Coalition has made available to the Commission “prototypes” of portable devices that it believes would be used in the band, it is not at all clear that these devices are representative of the types of devices that would operate in the band if mobile or portable services were permitted. Moreover, in its own recent testing of the prototypes, OET found that the devices “do not consistently sense or detect TV broadcast or wireless microphone signals.”⁴² Thus, as OET’s own testing demonstrates, much greater validation of the sensing capabilities of the proposed portable or mobile TV band devices would be needed before the Commission could comfortably predict that portable or mobile operations would not cause harmful interference to existing incumbent TV band operations.

Geolocation techniques would also not provide adequate protection to TV operations against interference from portable and mobile devices. As MSTV/NAB have noted, geolocation,

⁴¹ See Cox Comments at 5.

⁴² Office of Engineering and Technology, FCC, “Initial Evaluation of the Performance of Prototype TV-Band White Space Devices, OET Report FCC/OET 07-TR-1006 (July 31, 2006) (“OET Test Report”), at x (Executive Summary).

which uses GPS technology, does not work effectively inside buildings, where portable devices and TV sets will often be operating in close proximity.⁴³

Finally, new personal or portable applications may also be incompatible with new fixed operations in the TV bands for the same reasons that they are incompatible with incumbent fixed operations, including broadcast television stations. Low-power devices may not adequately sense the presence of co-channel or adjacent channel signals from fixed operations. In addition, because the devices would be mobile or portable, it is likely that they could come into close contact with fixed services operating in the TV bands.

II. THE COMMISSION SHOULD LICENSE THE “WHITE SPACES” SPECTRUM.

There is Significant Demand for Licensed Spectrum.

The wireless industry continues to experience substantial growth, with new services and features offered almost daily. As the industry grows, so too does the need for suitable spectrum. As an example of the pent-up demand for exclusive-use spectrum, the recent AWS auction attracted 168 qualified bidders and raised \$13.7 billion in net revenues.⁴⁴ In addition, the upcoming 700 MHz auction has generated intense interest from existing licensees and potential new entrants. In fact, the Congressional Budget Office has estimated that the spectrum will generate \$10 billion or more at auction.⁴⁵

As commenters have noted, the TV bands are “prime” spectrum⁴⁶ with propagation characteristics similar to the spectrum slated for the 700 MHz auction. Because of the

⁴³ MSTV/NAB Joint Comments at 35.

⁴⁴ See Auction 66: Advanced Wireless Services (AWS-1), at http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=66 (last accessed June 22, 2007).

⁴⁵ See Congressional Budget Office, Cost Estimate, Reconciliation Recommendations of the House Committee on Energy and Commerce, 12 (Oct. 31, 2005).

⁴⁶ See *Further Notice* ¶ 30; see also, e.g., Comments of Qualcomm Incorporated in Docket No. 04-186 (Nov. 30, 2004) at 13 (“The spectrum at issue is prime spectrum.”) (“Qualcomm 2004 Comments”).

propagation characteristics, this spectrum is much more valuable to entities that would provide long-range services than to the unlicensed entities that would provide low-power, short range services. It would therefore be wasteful and inefficient to have the spectrum used for unlicensed, low-power applications when the propagation characteristics of the TV bands lend themselves to valuable, high-power licensed uses that would pose far less of a risk of harmful interference.

By the same token, there is less need for additional unlicensed spectrum. The Commission has already made significant amounts of unlicensed spectrum available in recent years, including more than 100 megahertz of spectrum under 3 GHz.⁴⁷ In 2003, when the Commission added an additional 255 megahertz of spectrum for unlicensed use to the already-existing 300 megahertz allocation, the Commission increased the amount of spectrum available for use by unlicensed devices in the 5 GHz band by nearly 80%.⁴⁸ This large amount of additional spectrum is more than double the amount that will be auctioned in the 700 MHz band. Because unlicensed devices are already allowed to operate on a large amount of spectrum, including the 2.4 GHz band and several frequencies in the 5 GHz band, there is plainly no need for the Commission to make available more spectrum for unlicensed uses in the TV Bands.

A Licensed Approach Encourages the Most Efficient Use of the “White Spaces” and Avoids the “Tragedy of the Commons.”

The long-range propagation characteristics of the TV bands are particularly suitable for licensing and the higher-powered operations that licensing allows. On the other hand, if the

⁴⁷ See, e.g., the 902-928 MHz, 1920-1930 MHz, and 2400-2483 MHz bands; see also MSTV/NAB Joint Comments at 38.

⁴⁸ See *FCC Makes Additional Spectrum Available for Unlicensed Use*, FCC News Release, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-241220A1.pdf (rel. Nov. 13, 2003). Moreover, in the 5 GHz Unlicensed National Information Structure band, unlicensed devices have access to nearly twice the amount of spectrum that will be allocated to the public’s free, over-the-air television service after the digital transition is complete. See MSTV/NAB Joint Comments at 38.

Commission adopts an unlicensed model for new entry in the TV bands, it would be difficult for users to take advantage of the bands' long-range propagation capabilities without suffering or causing harmful interference.

The Commission acknowledged in the *Further Notice* that the licensed model is more efficient than the unlicensed model in many cases, particularly when spectrum rights are (1) clearly defined, (2) exclusive, (3) flexible, and (4) transferable.⁴⁹ By granting exclusive and clearly defined rights, the Commission would be providing new users of the TV bands with the proper incentives to avoid harmful interference, thereby promoting the efficient use of the “white spaces” and avoiding the “tragedy of the commons.”⁵⁰ On the other hand, given the TV bands' excellent propagation characteristics and the resultant high potential for interference, allowing the operation of an unlimited amount of unlicensed devices would result in the over-exploitation of the band. Unlike the situation that exists in the 2.4 GHz band, an unlicensed regime for the TV bands would preclude the licensed use of the “white spaces.”⁵¹ Therefore, the proper way to allocate this resource efficiently is through exclusive-rights licensing.

⁴⁹ See *Further Notice* ¶ 27; see also Evan Kwerel and John Williams, *A Proposal for a Rapid Transition to Market Allocation of Spectrum*, FCC OPP Working Paper, at 5-6 (2002).

⁵⁰ See, e.g., Thomas W. Hazlett, *Spectrum Tragedies*, 22 *Yale J. on Reg.* 242 (2005); Garrett Hardin, *The Tragedy of the Commons*, *SCIENCE* 162, 1243-48 (1968) (“Hardin”). The “tragedy of the commons” occurs in situations where operations are unlicensed because, in those situations, individual operators have the incentive to maximize their own use without concern for the efficient use of the “commons” as a whole, resulting in the over-exploitation and degradation of the resource. See, Jerry Brito, *The Spectrum Commons in Theory and Practice*, 2007 *STAN. TECH. L. REV.* 1, ¶¶ 19, 87 (2007) (“Brito”); Hardin, at 1244; see also Spectrum Policy Task Force Report, ET Docket No. 02-135, at 40-41 (Nov. 15, 2002) (recognizing that new technologies cannot eliminate scarcity completely). However, when a commons is privately owned or licensed and the owner or licensee holds well-defined rights, the licensee internalizes the costs of its actions and therefore makes efforts to avoid the problem that affects unlicensed regimes. An owner or licensee also has the power to manage the resource by setting and enforcing rules and excluding others from its use. Brito ¶ 20; see also Comments of Charles L. Jackson & Dorothy Robyn in Docket No. 04-186 (Jan. 31, 2007) at 5 (“Jackson & Robyn Comments”); “Digital Age Communications Act: Report from the Working Group on New Spectrum Policy, Progress and Freedom Foundation, at 4 (March 2006) (concluding that the commons approach cannot be the primary direction of spectrum reform) (“Working Group”).

⁵¹ See Jackson & Robyn Comments at ii.

In other circumstances where the Commission has allowed unlicensed use, harmful interference and a diminishment of the spectrum value has resulted. For example, Citizens Band (“CB”) radio was a government commons that eventually succumbed to overcrowding.⁵² This problem has also occurred in the 2.4 GHz band, where cordless phones have caused interference to other devices, including Wi-Fi routers. Overcrowding and interference would be much worse in the TV white spaces because of the excellent propagation characteristics, which ensure that any interfering signal would go much further than in other bands. The problems encountered in many unlicensed bands can be avoided by allowing licensees of the TV bands to internalize the costs and benefits of rules and enforcement, police the use their authorized frequencies, and take action against interference.⁵³

A licensed approach also provides flexibility for future use. If the Commission determines in the future that it is in the public interest to reallocate the “white spaces” spectrum, it can only effectively move the “white spaces” users if the TV bands are licensed. Once the Commission chooses an unlicensed regime for a band, it will be nearly impossible to identify all unlicensed users and remove all unlicensed devices. Even if a technological solution can be identified, if a large number of unlicensed users exist in a band, the Commission may be hesitant to force notification and relocation of those users even if the move would increase the efficient use of the spectrum.

A Licensed Approach Best Protects Against Interference to Incumbent Users.

Because the spectrum at issue in this proceeding would allow far better propagation than other unlicensed bands, unlicensed operations could, as a result, cause a much greater amount of

⁵² Brito ¶ 37.

⁵³ *Id.*

interference to incumbent and other operations. By contrast, licensed fixed systems can be easily designed to protect broadcasters and other incumbent users from harmful interference. A licensed approach would also encourage “white spaces” licensees to cooperate with broadcasters and other incumbents to maximize spectrum use and limit harmful interference. In fact, the Commission could facilitate even greater efficiency by allowing “white spaces” licensees and broadcasters to negotiate private agreements regarding the exact license “edges,” spectrally and geographically.⁵⁴

Licensing fixed services in the TV bands would also address the interference concerns raised by wireless microphone manufacturers⁵⁵ and manufacturers and users of wireless medical telemetry devices.⁵⁶ To the extent that these devices may need to operate near potential new fixed services, the Commission has several options available to eliminate harmful interference. First, the Commission could and should set aside part of the TV bands for wireless microphones and medical telemetry devices to prevent new fixed services from using those channels. In the case of wireless microphones, this could be achieved by setting aside channels for wireless microphone use (if not already used for TV operations), and prohibiting new fixed services from operating on the channels. In the case of wireless medical telemetry, the Commission could and should prohibit new fixed services from operating on TV channels 36 and 38, which are adjacent to channel 37’s licensed wireless medical telemetry service (“WMTS”) operations. Second, the Commission could establish a “coordination point” in each geographic area through which the incumbents and new fixed services licensees could communicate to resolve interference issues.

⁵⁴ *See id.* at 47.

⁵⁵ *See, e.g.,* Shure April 30, 2007 Comments.

⁵⁶ *See* Comments of GE Healthcare in Docket No. 04-186 (January 31, 2007) at 8-10; Comments of ASHE in Docket No. 04-186 (January 31, 2007) (“ASHE Comments”).

Third, the Commission could and should require new fixed licensees to register their stations in a public database,⁵⁷ thus facilitating better coordination.

A Licensed Approach Provides Accountability and Regulatory Certainty to Stakeholders.

A licensed approach encourages greater accountability, regulatory certainty, and investment in technologies and services. If the operations of a licensee interfere with a broadcast television signal (or the signal of another incumbent user), the Commission and affected incumbents can identify the source of interference and make that entity accountable.⁵⁸ The *Further Notice* noted that the provision of licenses has the benefit of enabling policymakers and incumbent licensees to more rapidly and easily determine the source of any harmful interference and take appropriate action.⁵⁹ Under an unlicensed approach, however, there could be millions of users in the “white spaces,” which would make identifying the source of harmful interference virtually impossible. An unlicensed approach would also create a higher administrative burden on the Commission to identify and make accountable sources of harmful interference.

Exclusive-use licensees have the incentive to make efficient choices about spectrum use,⁶⁰ as well as the ability to internalize both the costs and benefits, which minimizes coordination and other transaction costs.⁶¹ While awarding exclusive-use licenses would not eliminate all transaction and other costs (such as the costs of engineering techniques to allow efficient sharing of the spectrum by multiple users), licensees would have a much greater

⁵⁷ See ASHE Comments at 5; Shure January 31, 2007 Comments at 21.

⁵⁸ See *Further Notice* ¶ 30.

⁵⁹ *Id.*

⁶⁰ Evan Kwerel and John Williams, “A Proposal for a Rapid Transition to Market Allocation of Spectrum,” FCC OPP Working Paper, at 5 (Nov. 2002).

⁶¹ *Id.*

incentive than unlicensed users to develop and implement such techniques and minimize the costs involved.⁶²

Licensing the TV bands would also create a predictable spectrum use environment for the TV bands. This regulatory certainty would enable all stakeholders (including investors) to better plan and develop products and services that operate in the “white spaces.” An unlicensed approach would not create the economic incentives necessary to ensure that the spectrum is used efficiently, which, in turn, would discourage the deployment of significant amounts of investment capital into new wireless services.⁶³

Likewise, a licensed approach in the TV bands would also encourage the investment in and deployment of new technologies and services for this spectrum. Licensing and the development of clear interference and service rules would promote regulatory certainty and a predictable regulatory environment, factors which are necessary to attract investment of the large amount of capital necessary to spur development in the TV bands. Granting exclusive rights encourages operators to deploy advanced technologies and compete to drive down the costs of coordinating technology and infrastructure investments.⁶⁴ Licensing incentivizes companies to invest in network infrastructure and prevents other entities from free-riding on a company’s investments.⁶⁵

As noted previously, the TV Bands provide a unique opportunity for the promotion of rural broadband deployment, and licensed entities will have better incentives to provide long-

⁶² *Id.*

⁶³ See Jackson & Robyn Comments at 6; Working Group at 4 (without property rights, “the large investments needed to use the available spectrum efficiently and create new wireless services are likely to be delayed and/or dampened, with adverse consequences for the U.S. economy”).

⁶⁴ See Hazlett at 273-74.

⁶⁵ A hybrid model would only highlight the free-rider problem by allowing unlicensed entities to avoid the costs of building network infrastructure and the burdens of negotiating with TV stations that the licensed entities would have even though both would be using the same spectrum.

range wireless Internet access and to make the large investments in long-range infrastructure that rural broadband requires.⁶⁶ Although supporters of the unlicensed regime claim that more unlicensed spectrum will expand the deployment of wireless broadband, granting exclusive rights is the only way to provide the certainty needed for companies to make the large investments that would make wireless broadband, especially to underserved areas, a reality.⁶⁷ Hence, licensing provides the incentives for ensuring that the spectrum is employed in its most valued use, which serves the public interest.

A wide range of commenters in this proceeding support licensed use of the TV bands. For example, Cox Broadcasting, Inc. argues that only licensees have the incentives to more easily and quickly resolve interference problems and ensure that licensed devices are functional, compliant, and rapidly available to the public; and “provide the certainty necessary for meaningful investment—not just in today’s innovations, but in tomorrow’s as well.”⁶⁸ The Community Broadcasters Association has stated that “[l]icensing of the TV Broadcast Band for use by white space devices is the best way for the FCC to implement new services in the TV Broadcast band.”⁶⁹ Entravision contends “that a licensing scheme is essential to device operators taking seriously their obligation to ensure that their devices do not interfere with the signals of local television stations.”⁷⁰ Manufacturers, including Qualcomm,⁷¹ also support a licensed approach: “[w]hite space licensees would have powerful incentives to negotiate

⁶⁶ Jackson & Robyn Comments at ii.

⁶⁷ See Thomas Lenard, *Perspective: Why Don't We Just Auction the 'White Space'?*, available at http://news.com.com/2010-1036_3-6072534.html (May 16, 2006).

⁶⁸ Cox Comments at 6.

⁶⁹ Comments of Community Broadcasters Association in Docket No. 04-186 (Jan. 31, 2007) at 3.

⁷⁰ Comments of Entravision Holdings at 6.

⁷¹ See Qualcomm 2004 Comments at 11-13; Qualcomm 2007 Comments at 4-6 (stating that the Commission should use the licensed model because it will promote innovation and result in the public reaping full value from the highest and best use of this prime spectrum) (“Qualcomm Comments”); see also Comments of Telex Communications in Docket No. 04-186, at 1 (Nov. 30, 2004).

agreements with potentially affected TV stations, to use the White Space spectrum for its highest and best use, to innovate, and to make the investments necessary in network infrastructure.”⁷²

This broad base of support for licensed use (based in part on the harms from unlicensed use pointed out by these groups), demonstrates the need for pursuing a licensed approach.

Finally, the Commission should not rely on the “hybrid” use model that it adopted for the 3650-3700 MHz band. The propagation characteristics of the 3650-3700 MHz band are significantly less attractive than the propagation characteristics of the TV bands. These propagation characteristics make it less likely that a relatively large number of licensees will attempt to coexist in the 3650-3700 MHz band. Thus, a shared-use or non-exclusive licensing model may work more effectively in that band. The propagation characteristics of the TV bands, however, make a shared-use model unworkable (as discussed above, an unlicensed model is unworkable in part for the same reason). The TV bands are also significantly more encumbered than the 3650-3700 MHz band, further limiting the ability of the Commission to obtain successfully the same “intensive use” contemplated under the hybrid model.

A Licensed, Fixed Service Approach is Feasible and the Commission Should Undertake a Rulemaking Proceeding to Adopt Appropriate Service Rules.

Appendix A includes a draft outline for technical regulations that could govern fixed service operation in the TV bands. The proposal offers a starting point for technical rules that would both protect incumbents and offer opportunities for new point-to-point broadband services. The Commission should undertake a notice-and-comment rulemaking proceeding to consider whether technical rules similar to those proposed here achieve both the public interest imperative

⁷² Qualcomm 2007 Comments at 5.

of offering continued interference-reception of over-the-air television as well as using available spectrum resources as intensively as possible.

III. THE COMMISSION SHOULD LICENSE THE TV BAND SPECTRUM ON AN AUCTION OR FEE BASIS.

An Auction, or the Current License Fee Approach, Will Ensure That The “White Spaces” are Used Efficiently.

Consistent with the requirements and goals of Section 309(j), an auction, or the current licensee fee approach, would allocate licenses to those that place the highest value on the use of the spectrum. These entities, the Commission has repeatedly recognized, are presumed to be those best able to put the spectrum to its most efficient use.⁷³ In addition, these entities can be expected to make the most intensive use of the spectrum.⁷⁴ Moreover, an auction or fee-based system would foster rapid deployment of services and allow the spectrum to be put to its most efficient use right away.⁷⁵

⁷³ See, e.g., *Public Notice DA 00-49 Auction of C and F Block Broadband PCS Licenses, NextWave Personal Communications, Inc. and NextWave Power Partners Inc. Petition for Reconsideration, File Nos. 00341CWL96, et al.*, Order on Reconsideration, 15 FCC Rcd 17500, 17513 ¶ 24 (2000) (“Section 309(j) embodies a presumption that licenses should be allocated as a result of an auction to those who place the highest value on the use of the spectrum. Such entities are presumed to be those best able to put the licenses to their most efficient use.”); *Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use*, Second Report and Order, 11 FCC Rcd 624, 644-46 (1995) (“[T]he system of competitive bidding . . . will lead to the issuance of licenses to those parties who value the licenses most highly and who thus can be expected to make efficient and intensive use of the spectrum”); *In the Matter of Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Report and Order, 9 FCC Rcd 2348, 2349-50 ¶ 4 (1994); Evan Kwerel & Walt Stack, FCC, *Auctioning Spectrum Rights*, at 2, available at <http://www.fcc.gov> (Feb. 20, 2001) (“Well-designed auctions are more likely than comparative hearings to assign licenses to the parties that value them most highly.”). See also 47 C.F.R. Part 101 (Fixed Microwave Services). Through Part 101, the Commission instituted and efficiently operates, among other things, a fee-based system for point-to-point fixed wireless microwave licensing and coordination.

⁷⁴ *Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use*, Second Report and Order, 11 FCC Rcd 624, 644-46 (1995). Valuing the spectrum through an auction, or the current license fee approach, would also prevent the “tragedy of the commons” problem discussed in more detail above.

⁷⁵ See, e.g., *Revision of Rules and Policies for the Direct Broadcast Satellite Service*, Notice of Proposed Rulemaking, 11 FCC Rcd 1297, 1329 ¶ 77 (1995) (“More than any other method of awarding construction permits, auctions are likely to foster the rapid deployment of new technologies and products by putting spectrum in the hands of those who value it most highly.”).

The Commission may also be required to auction the TV bands spectrum. The Commission will likely be asked to accept mutually exclusive applications to provide service in the TV bands.⁷⁶ Should the Commission decide to accept such applications, Section 309(j) requires that it auction the spectrum.⁷⁷

Requiring Licensees to Bid on Spectrum or Coordinate Fee-Based Areas Further Reduces the Potential for Harmful Interference and Ensures That the Public is Appropriately Compensated for the Licensee’s Use of the Spectrum.

An auction, or the use of fee-based areas, for the TV band spectrum would provide an economic incentive for new users of the spectrum to avoid causing harmful interference to others. After obtaining a license for a significant sum, a licensee can be expected to act diligently to preserve the license and, as a result, prevent the occurrence of harmful interference from its services that could threaten its licensee status.

An auction or license fee-based approach would also satisfy the requirement in Section 309(j) that the Commission ensure a “recovery for the public of a portion of the value of the public spectrum resource made available for commercial use and avoidance of unjust enrichment.”⁷⁸ The “white spaces” spectrum is very valuable and has excellent propagation characteristics—even with its “Swiss cheese” composition.

An Auction or License Fee-Based System is Appropriate Because the Commission Can Identify a Specific “Bundle of Rights” for Licensees.

In defining the spectrum usage rights that would be assigned via auction or license fees, the Commission should start with the default bundle of rights that it has adopted in other exclusive-use regimes, including licenses with geographic service areas. Although the *Further*

⁷⁶ For example, the use of exclusive-use, geographic area-licensing would create mutually exclusive applications.

⁷⁷ See 47 U.S.C. § 309(j).

⁷⁸ *Id.* § 309(j)(3)(C).

Notice notes that the amount of usable TV band spectrum will vary by market and could change over time,⁷⁹ the Commission could structure the licensing to assign different amounts of spectrum in different markets or conduct additional auctions or license fee-based area availability as more “white space” spectrum becomes available.⁸⁰ To the extent the Commission must account for the possibility of a broadcast station changing frequencies, it can easily resolve the situation by requiring an affected “white spaces” licensee to “swap” frequencies with the broadcaster. To the extent the Commission must account for a broadcast station that wishes to change its tower location (although this will likely be a rare occurrence), it can adopt a fee-based process by which the fixed service licensee obtains through coordination another link; in areas where enough spectrum availability exists, it may be possible to make available geographic area-based licenses. The Commission has granted geographic area overlay licenses in other circumstances, and it has been able to minimize coordination costs and burdens by defining geographic license areas that are large enough to ensure that only a small amount of the license falls within coordination distance of the border and by using simple geographic distance rules or engineering rules to define harmful interference.⁸¹

Finally, even if the Commission determines that an auction is not in the public interest, the Commission should nonetheless adopt a licensed regime for fixed use in the TV bands, for the reasons detailed above.

⁷⁹ See *Further Notice* ¶ 28.

⁸⁰ See Qualcomm 2007 Comments at 6.

⁸¹ See Jackson & Robyn Comments at 52, n. 66. In addition, these concerns would be internalized by an auction participant when bidding on the spectrum. They should not weigh against licensing and auctioning the spectrum.

Conclusion

FiberTower and RTG applaud the Commission's efforts to open up the TV bands for new fixed services. Because only fixed services provide the protection to incumbent users necessary to avoid harmful interference, the Commission should prohibit the introduction of new mobile and portable operations in the TV bands. Moreover, by authorizing fixed services in the TV bands, the Commission would have a unique and practical opportunity to advance its broadband and competition policy goals and encourage the deployment of wireless broadband services in "prime" spectrum, especially in rural areas. The Commission should also auction or license the available spectrum in the TV bands on a fee basis to ensure that this valuable spectrum is put to its highest and best use and that the public is duly compensated.

Respectfully submitted,

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Appendix A
Technical Rules for Fixed Licensed Use of TV White Spaces

- 1) **Priority:** Fixed use would be secondary to, and have to protect, all “full power” DTV stations.
- 2) **Frequencies/Channels:** Fixed use would be licensed only on UHF TV channels 14-35 (470-596 MHz) and 39-51(620-698 MHz).
- 3) **Power and Antenna Limits:** Follow 74.602(h), which applies to TV STL, TV relay stations, and TV translator relay stations. EIRP limited to 35 dBW.
- 4) **Antenna Requirements:** Generally follow 74.602(h). Antenna beamwidth and vertical polarization requirements would apply for fixed stations located within line-of-sight (LOS) of a co-channel or first adjacent channel TV station’s protected contour (discussed below). LOS determined using $D \leq 4.13(\sqrt{H_T} + \sqrt{H_R})$, where H_T is the height of the fixed station’s transmitting antenna and H_R is the height of the TV receiving antenna. D (LOS distance) is in km and heights are in meters. Suggest setting H_R to 10 meters. Fixed stations beyond LOS could use antennas with broader beamwidth and non-vertical polarization.
- 5) **DTV Station Protection:** Licensed fixed operations would be required to protect co-channel and first-adjacent channel “full power” DTV stations pretty much the same as DTV stations must protect each other. That is, licensed fixed co-channel or adjacent channel operation would not be permitted within the protected contour of a TV station. The protection contours for DTV stations are specified in 73.622(e) of the FCC’s rules. Fixed operation outside the DTV protected contour would be based on the protection levels specified for DTV-to-DTV in 73.623(c)(2); i.e. D/U ratios of +15 dB co-channel, and -26 dB or -28 dB for first adjacent channel. If the fixed operation is beyond LOS of the edge of the DTV protected contours, then no study would be needed. If it is within LOS of the protected contour, then a study would have to be done to show that the fixed station’s signal does not exceed the required protection (in dB) to the DTV’s signal strength.
- 6) **New Full-Power DTV Stations and DTV station maximization/relocation requests.** Fixed stations may not object to a new “full power” DTV station or an existing DTV station’s maximization or relocation request. However, if a new DTV station or maximization or relocation of an existing DTV station is implemented after February 17, 2010 (one year after DTV transition is complete), then the DTV licensee must provide at least 120 days advanced notice of such changes to the fixed service licensee to ensure that their network can be reconfigured as necessary.

7) **Wireless Microphones:** Wireless microphones can operate on VHF TV channels, on UHF TV channels 36 and 38, and in the 1st adjacent channels to DTV stations, where fixed stations wouldn't be permitted to operate. Wireless mike operators could also coordinate and get agreement of fixed licensee to operate on other channels.

8) **LPTV and TV Translators:** Fixed stations must protect DTV LPTV and TV translators in operation by February 17, 2010 (one year after DTV transition is complete). New DTV LPTV and TV translators after February 17, 2010, would need to be coordinated with and get agreement of the fixed licensee to operate; however, every effort should be made to accommodate coordination requests from DTV LPTV and TV translators that must be moved to another channel as a result of the DTV transition.

9) **Medical Devices:** Fixed stations would be prohibited from operating on channel 37, which is set aside for radio astronomy and medical device use, and on first adjacent channels 36 and 38.

10) **Land Mobile:** In 13 US cities (Boston, Chicago, Cleveland, Dallas/Fort Worth, Detroit, Houston, Los Angeles, Miami, New York, Philadelphia, Pittsburgh, San Francisco, and Washington), the FCC has authorized land mobile operations on one or more channels in the range of 14-20. 90.305 specifies the locations at which base and mobile stations may operate. Fixed stations shall protect land mobile stations from interference. Fixed stations may operate without coordination beyond LOS from the maximum base and mobile station locations, as specified in 90.305. Fixed stations may also operate within LOS of the land mobile operations after coordination with the land mobile licensees.

11) **TV STL and Relay Links:** Fixed stations must protect existing TV STL and relay links in operation by February 17, 2010 (one year after DTV transition is complete). New TV STL and relay links after February 17, 2010, would need to be coordinated with and get agreement of the fixed licensee to operate; however, every effort should be made to accommodate coordination requests from TV STL and relay links that must be moved to another channel as a result of the DTV transition.