"WHITE SPACE DEVICES" & THE MYTHS OF HARMFUL INTERFERENCE

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INTRODUCTION

Today we are living through a critical juncture in telecommunications history akin to the advent of the telephone, radio, or television. Computers and other digital technologies have enabled an entirely new communications medium—distributed, portable, "device as infrastructure" networks. Within these networks, end-user devices are "smart": they are capable of adapting to changing environments and maximizing efficient use of available spectrum to deliver mobile, affordable broadband connectivity. A coalition of consumer and other public interest groups, along with a number of high-tech companies, actively support the widespread adoption of these innovative new technologies.[2]

White space devices (WSDs) employ spectrum sensing technologies (so-called, "smart radios") to automatically detect occupied television frequencies.[3] These technologies allow WSDs to identify and utilize the unassigned frequencies between broadcast television channels and outside the coverage areas of licensed broadcasters. They

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2. *See* Wireless Innovation Alliance: Home, http://www.wirelessinnovationalliance.com/ (last visited Apr. 18, 2008).

3. Steven K. Jones & Thomas W. Phillips, Fed. Commc'n. Comm'n [hereinafter FCC], Office of Eng'g & Tech., OET Report FCC/OET 07-TR-1006, Initial Evaluation of the Performance of Prototype TV-Band White Spaces Devices viii, 14 (2007) [hereinafter Prototype B Initial Evaluation], *available at* http://fjallfoss.fcc.gov/edocs_public/attachmatch/DOC-275666A1.pdf.

can utilize the unoccupied frequencies in the television bands for digital communications—including broadband networks—forming the foundation for a new communications era that incorporates advances in miniaturization and transceiver technologies to better meet the needs of consumers. WSDs facilitate and improve home, business, city, community, and regional networks, enabling everything from increased rural and municipal broadband access, to enhanced public safety communications, more reliable video conferencing, and the potential for any number of future personal consumer applications or devices. WSDs will make possible more affordable broadband deployment, particularly in underserved rural areas, as well as stimulate new innovations in consumer products, services, and applications.

The primary obstacle to the boost for mobile broadband deployment and wireless innovation is obtaining unlicensed access to unused portions of the public airwaves. "Unlicensed" access ensures that everyone may broadcast on the band. This differs from licensed access (for example, FM radio), where one must obtain a license from the FCC to broadcast.[4] In the unlicensed bands, a broadcaster need not obtain prior approval from the Commission.

Opponents of WSDs have lobbied to prevent the widespread deployment of these technologies and have launched a massive public relations effort to spread uncertainty about the viability of WSD technology. This Article challenges the often-flawed assertions of these opponents and documents the many benefits WSDs afford. For example, contrary to opponents' arguments, data demonstrates the feasibility of WSDs to support the issuance of technical specifications. In fact, WSD prototypes can sense occupied television channels at or below -114 dBm – a signal level roughly 1/1,000th the power that a television set needs to display an image. WSDs can adequately sense channels occupied by licensed television broadcasters, mobile WSDs can detect and protect wireless microphones currently using the band, and WSD transmissions will not cause harmful interference to television broadcasts on immediately adjacent channels. Not only are WSDs critical to meeting new consumer needs, WSD manufacturers and public interest groups also have powerful incentives to protect the quality of over-the-air television reception.

This Article establishes the public benefits of these devices and exposes the flaws embedded in the conclusions of WSD opponents. This Article also explains the Federal Communications Commission's

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4. FCC, Wireless Telecomm. Bureau, http://wireless.fcc.gov/index.htm?job=rules_and_regulations (last visited July 27, 2008).

multi-step process for ensuring that WSDs will not cause harmful interference to existing licensed broadcasters while making feasible technologies widely available to consumers. Contrary to unfounded criticisms, the combination of these benefits and the regulatory protections mandated by the FCC all support the widespread adoption of WSDs.

I. BACKGROUND ON WHITE SPACE DEVICES AND THE FCC PROCESS

A. *What are TV Band "White Spaces" and "White Space Devices"?*

White spaces are vacant frequency bands between either occupied (licensed) broadcast television channels or broadcast auxiliary services like wireless microphones. White spaces exist primarily because analog television receivers were highly susceptible to interference, requiring the FCC to create frequency "guard bands" between television channels in order to prevent interference. For example, in a given viewing market, if channel 9 is licensed, channel 8 and 10 will be vacant, as will channel 9 in any neighboring viewing market. Because of these vacancy requirements—both in between existing channels in the same market and in the spacing between broadcasters operating in the same channel—and because broadcasters have focused on metropolitan service, there are many rural markets with a relatively small number of licensed television channels, leading to a vacancy rate of 80 percent.[5] After the completion of the Digital Television Transition (DTV) transition in February 2009, the amount of white space in most of the nation's 210 local television markets will greatly exceed the amount of occupied frequency bands or spectrum,[6] even in most major cities.[7] Broadcasters currently may use two televi-

5. *See* Pierre de Vries, Populating the Vacant Channels: The Case for Allocating Unused Spectrum in the Digital TV Bands to Unlicensed Use for Broadband and Wireless Innovation 5 (New Am. Found., Working Paper No. 14, 2006), http://www.newamerica.net/files/WorkingPaper14.DTVWhiteSpace.deVries.pdf (last visited July 27, 2008).

6. The electromagnetic (EM) spectrum is "[t]he entire range of radiant energies or wave frequencies from the longest to the shortest wavelengths—the categorization of solar radiation." Earth Observatory Glossary, http://eobglossary.gsfc.nasa.gov/Library/glossary.php3?mode=alpha&seg=e (last visited Mar. 28, 2008). White spaces are areas of the spectrum that are not currently carrying broadcast transmissions (e.g., are between two occupied channels, are outside the broadcast area for a channel). *Id.*

7. The share of the DTV band (channels 2-to-51) that will be vacant after the February 2009 end to analog transmission ranges from 30 percent in the most congested, coastal markets (e.g., Trenton, N.J.) to 80 percent or more in small town and

sion channels to broadcast both a digital and analog signal.[8] After the transition, the FCC has mandated that broadcasters return the analog channel, clearing channels 52 through 69 nationwide and nearly halving the number of occupied television channels between 2 and 51.[9]

The same propagation characteristics that make TV broadcast frequencies so preferred are also useful for expanding affordable, high-capacity, wireless broadband. The Public Interest Spectrum Coalition[10] wants to open access to these unoccupied bands for everyone by allowing wireless devices certified by the FCC to operate on vacant frequencies, in much the same way that tens of millions of Wi-Fi devices successfully share a smaller, less desirable band of unlicensed spectrum today with millions of cordless phones and other unlicensed consumer devices.[11] Wi-Fi technology and devices, such as wireless routers and cards used for home and business networking and mesh networking devices for community and municipal wireless networks,

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rural markets (e.g., Fargo, N.D.). For more information and a survey mapping available white space in a representative number of television markets, *see* New Am. Found., Measuring the TV "White Space" Available for Unlicensed Wireless Broadband 3, 25–27, 49–51 (2005), *available at* http://www.newamerica.net/publications/policy/measuring_tv_white_space_available_for_unlicensed_wireless_broadband.

8. *See* J.H. Snider, Reclaiming the Vast Wasteland: The Economic Case for Re-Allocating the Unused Spectrum (White Space) Between TV Channels 2 and 51 to Unlicensed Service, New Am. Found., Feb. 2006, *available at* http://www.newamerica.net/files/archive/Doc_File_2898_1.pdf.

9. According to J.H. Snider, the former Research Director of the Wireless Future Program at the New America Foundation, "[c]hannels 52-to-69 will be cleared of TV signals in all 210 local TV markets. Four of these channels are being reallocated for public safety agencies, while ten others have been recently auctioned for exclusive, licensed use by commercial wireless firms. *Id.*; *see also* Serv. Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Comm'n Rules, WT No. 99-168, F.C.C. 00-5, at 4-5 (2000) (first report and order) [hereinafter First Report and Order] (describing the reallocation plan for several television stations); Reallocation and Serv. Rules for the 698-746 MHz Spectrum Band (Television Channels 52-69), WT No. 01-74, F.C.C. 02-185, at 2-3 (2002) (memorandum opinion and order) [hereinafter Memorandum Opinion and Order] (addressing the issues related to the transition to DTV service of several broadcasting stations).

10. The Public Interest Spectrum Coalition consists of members supporting unlicensed access to television white space and includes the Consumer Federation of America, Consumers Union, EDUCAUSE, Free Press, the Leadership Council on Civil Rights, the National Hispanic Media Coalition, Media Access Project, New America Foundation, and Public Knowledge, among others. Serv. Rules for the 698-746, 747-762, and 777-792 MHZ Bands, WT No. 06-15, at i-1 (2007) (*ex parte* comments of the *ad hoc* Public Interest Spectrum Coalition) [hereinafter Comments of the PISC], *available at* http://www.mediaaccess.org/filings/2007-08-28-PISC-M2ZComments.pdf; Unlicensed Operation in the TV Broadcast Bands, ET No. 04-186, at (2007) (reply comments on OET Unlicensed Device Testing by NAF et al. before the F.C.C.) [hereinafter Reply Comments by NAF].

11. Pub. Interest Spectrum Coal., http://www.publicknowledge.org/pdf/pisc-oa700mhz-exparte-20070405.pdf (last visited June 8, 2008).

have flourished in the 2.5 GHz frequency band despite the potential for substantial interference from other unlicensed devices such as cordless phones. Opening the white spaces in the TV bands to Wi-Fi devices would not only provide a more interference-free environment, but it would also increase the scale and quality of service for Wi-Fi networks due to the superior propagation characteristics of these frequencies, i.e. the ability of signals to pass through obstacles such as foliage and walls.[12] In fact, the unique propagation characteristics of the UHF television spectrum allow television signals to travel long distances over diverse terrain at relatively low power, thus increasing the cost-effectiveness of Wi-Fi-type networks in these frequencies.

WSDs take advantage of the wireless innovations of the past fifteen to twenty years and utilize spectrum-sensing technology to automatically detect occupied TV frequencies, allowing the public to use spectrum that would otherwise be inefficiently used or entirely unoccupied.[13] With the growing use of Wi-Fi and other unlicensed devices in everything from laptops to next-generation PDAs and cell phones, WSDs provide much-needed additional capacity for broadband connectivity, home and community networking. The remaining challenge to capitalize on these opportunities is for the FCC to define explicit operating rules for WSDs so that high-tech industries can embark on the research and development necessary to bring compliant consumer devices to market.

B. The FCC's Role in Regulating and Promoting WSDs

The FCC's regulatory process includes three phases: (1) feasibility testing to document the viability of the technology, (2) adoption of technical standards to ensure that WSDs co-exist with one another and existing broadcast uses, and (3) certification of consumer WSDs to ensure that they conform to established technical standards.

The FCC provides for the operation of unlicensed radio transmitters or WSDs under its Part 15 rules.[14] Operation under Part 15 is subject to the condition that the device does not cause harmful interference to authorized services and that it must accept any interference

12. "Wi-Fi Plus will enable WISPs to reach more customers in underserved rural and urban areas. Lower frequencies with better propagation characteristics are better suited for creating cost-effective, robust wireless broadband in areas with low customer density. An Intel study estimates that a rural wireless network transmitting on the 700 MHz TV band can cover four times the area, and at a higher quality of service, than a network transmitting at 2.5 GHz." *See* De Vries, *supra* note 5, at 8.

13. *See* New Am. Found., *supra* note 7, at 1.

14. *See* Unlicensed Operation in the TV Broadcast Bands, 71 Fed. Reg. 66876, 66876 (Nov. 17, 2005) (to be codified at 47 C.F.R. pt. 15).

received by incumbent or licensed users.[15] The current Part 15 rules provide substantial flexibility in the types of unlicensed devices that individuals can operate. However, the FCC prohibits operation on certain frequencies, including almost all of the bands used for broadcast television service.[16]

In May 2004, the FCC issued a Notice of Proposed Rulemaking (NPRM) to allow a new generation of wireless devices to use vacant TV frequencies (so-called "white spaces") on an unlicensed basis and thereby promote more effective use of the public airwaves.[17] In October 2006, under bipartisan pressure from Congress, the FCC adopted a First Order and Further NPRM that approved use of vacant television channels for "fixed" broadband deployments.[18] The First Order and Further NPRM called for further study on the question of whether "personal" and "portable" low-power devices, such as laptops and PDAs, could also use these empty airwaves without causing "harmful interference" to the dwindling number of over-the-air television viewers.[19]

II. Public Benefits of White Space Devices

Almost all community and municipal wireless networks—commercial businesses (e.g., wireless Internet service providers), municipal and community nonprofits, public-private partnerships, etc.—use unlicensed spectrum to transmit data.[20] While existing use of unlicensed spectrum has driven a remarkable amount of innovation, opening more low-frequency spectrum for WSDs is the catalyst needed to facilitate and improve home, business, and regional wireless networks.

Television frequencies are a valuable data networking tool for the same reasons that they are desirable for television broadcasts: they easily penetrate obstacles such as buildings and trees and can reach longer distances than the higher frequencies currently utilized by unli-

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15. *See id.* at 66877.

16. *See id.*

17. Unlicensed Operation in the TV Broadcast Bands, ET No. 04-186, FCC 04-113, at 2 (2004) (notice of proposed rule making) [hereinafter NPRM].

18. Unlicensed Operation in the TV Broadcast Bands, ET No. 04-186, FCC 06-156, at 1–2 (2006) (first report and order and further notice of proposed rulemaking) [hereinafter First Report and Order and Further NPRM].

19. *Id.* at 2. Roughly 12 percent of television households rely primarily on over-the-air reception, while 88 percent subscribe to cable or satellite television services. FCC, Pub. Safety Advisory on the Transition from Analog to Digital Television Broadcasts (effective Feb. 17, 2009) 1, *available at* http://www.dtv.gov/DTVPSA.pdf.

20. *See* Snider, *supra* note 7, at 4.

censed Wi-Fi devices.[21] Every region in America has a large quantity of low-frequency spectrum that is unoccupied at any given time. Although the particular empty channels vary in each local market, in most parts of the nation a majority of local television frequencies currently are not used—but could be—for affordable broadband access. The following sections discuss some of the benefits of broadband access to consumers and the U.S. economy.

A. Rural Broadband Deployment

The highly favorable propagation characteristics of the television broadcast spectrum (as compared to the 2.4 or 5 GHz bands) allow for wireless broadband deployment with a greater range of operation, including the ability to pass through buildings, weather, and foliage at lower power levels. Thus, the television white spaces could provide better broadband service in less densely populated areas as well as ubiquitous coverage for municipal wireless networks. Television white spaces would likely provide the first broadband service in many underserved areas, including rural and other remote regions. This is a critical need given the 15 percent "broadband gap" between rural and urban/suburban areas, according to the Pew Internet Project.[22] Today, between 2,000 and 3,000 wireless Internet service providers (WISPs) and rural telephone cooperatives already rely on the current "junk" bands of unlicensed spectrum to provide broadband to remote customers, mostly in rural areas.[23] This is why the Wireless Internet Service Provider Association (WISPA) and the National Telecom Cooperative Association (NTCA) advocate for the opening of the television white spaces for unlicensed access, since it would greatly reduce the cost and improve the quality of rural broadband deployment.[24]

B. Public Safety Communications

An increasing number of cities and counties across the nation—such as Pratt, Kansas, and Corpus Christi, Texas—have supplemented their voice communication networks with wireless broadband data

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21. *Id.* at 5.

22. Data Memo from the PEW INTERNET & AM. LIFE PROJECT REGARDING RURAL BROADBAND INTERNET USE 1 (Feb. 2006), *available at* http://www.pewinternet.org/pdfs/PIP_Rural_Broadband.pdf.

23. FCC, Availability of Advanced Telecomms. Capability in the U.S., Fourth Report to Congress 31 (2004).

24. Letter from John Scrivner, President, WISPA and Michael E. Brunner, Chief Executive Officer, NTCA, to Hon. Ted Stevens, Chairman and Hon. Daniel K. Inouye, Ranking Member, S. Comm. on Commerce, Sci., & Transp., *available at* http://www.ntca.org/content_documents/WS%20Senate%20Letter.pdf.

networks operating over unlicensed spectrum, most notably the 2.4 GHz "Wi-Fi" band. These cutting-edge, mobile, high-speed data networks complement voice systems and serve as a cost-effective means of delivering applications, including streaming video for surveillance and disaster response, fast downloads of suspect mug shots or building blueprints, and access to public safety databases. "By providing first responders with more resources in the field—and reducing the time they need to spend in the office—these wireless data networks act as a 'force multiplier,' improving overall public safety."[25] These public agencies argue that access to more and better spectrum in the television band would improve the capacity and quality of their networks, as well as facilitate their expanded use for e-government and consumer services.[26] In emergencies, the television white spaces could also provide auxiliary services to augment public safety communications. For example, placing remote video cameras at a disaster site to relay images to a command center could enhance rescue efforts, or first responders using portable "helmet cams" could provide real-time, first person visual information.

C. Education and Enterprise Video Conferencing

The television white spaces could be used to give local high schools and middle schools the same multimedia capabilities that are available to major university campuses: mobile, high-speed Internet access for every student and teacher with a laptop or portable wireless device. WSDs also can increase the reliability and decrease the cost of video conferencing on college and commercial campuses. This video conferencing could help enable distance learning for students in remote locations for whom traditional classroom-based learning is impractical. "E-rate" has succeeded in bringing a wired Internet connection to almost every classroom and library,[27] but providing the wireless capacity and penetration to allow every student in a school to

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25. *See* NAVEEN LAKSHMIPATHY, WIRELESS PUB. SAFETY DATA NETWORKS OPERATING ON UNLICENSED AIRWAVES: OVERVIEW & PROFILES 1, NEW. AM. FOUND. (2007), *available at* http://www.newamerica.net/publications/policy/wireless_public_safety_data_networks_operating_on_unlicensed_airwaves.

26. *See* OFCOM, Digital Dividend Review: A statement on our approach to awarding the digital dividend 46 (2007), *available at* http://www.ofcom.org.uk/consult/condocs/ddr/statement/statement.pdf.

27. USAC, Overview of the Schs. and Libraries Program, http://www.universalservice.org/sl/about/overview-program.aspx (providing a basic explanation of the E-Rate program) (last visited Aug. 14, 2008); Education and Library Networks Coal., Protect E-rate, http://www.edlinc.org/keeping_the_promise.html ("The E-rate. . .provides discounts on telecommunications services, Internet access and internal connections to libraries and schools. In the first two years, $3.66 billion in discounts have brought

access the Internet at high speeds and from any location, as our great universities do today, will require more and better spectrum access. This is why EDUCAUSE, which represents the nation's colleges and universities on technology issues, is a leading advocate of opening the television white space for unlicensed use.[28]

D. *Personal Consumer Applications*

WSDs also can provide new services and applications to consumers by taking advantage of the improved signal reliability, capacity, and range of the television broadcast spectrum. Wireless local area networks using low power and battery operated devices could enable new communications technologies that bring safety, convenience, and comfort to consumers in their homes. For example, WSDs could provide improved energy efficiency through intelligent home automation and power monitoring or improved home security with robust low power wireless video feeds.

E. *Mesh and Ad-Hoc Networks*

The television white spaces can enhance mesh networking.[29] Self-configuring, ad-hoc mesh wireless networks avoid disruption or failure by re-routing around node failures or congestion areas, thereby enabling more robust and reliable communications. Through use of mesh networks, communities that are underserved or lack service altogether could readily create their own cost-effective network extensions as an alternative means of Internet connectivity. In addition, because mesh networks are easily deployed, they offer a means of communications if existing networks telecommunications infrastructures fail.

F. *Security Applications*

The favorable propagation and bandwidth characteristics of the television broadcast spectrum could enable enhanced video security applications for commercial, residential, and government purposes.

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the Internet and new information technologies to tens of thousands of schools and libraries.") (last visited Aug. 14, 2008).

28. *See* EDUCAUSE, Fed. Policy Issues, http://www.educause.edu/FederalPolicyIssues/1284 (last visited Aug. 14, 2008).

29. "A mesh network has two or more paths to any node; nodes act as traffic relays for each other. Information can move between two nodes that are not directly connected by 'hopping' across intermediate nodes. A mesh can be contrasted with the point-to-multipoint networks used in cellular systems, where all nodes communicate directly with one central node, usually on a tower." *See* De Vries, *supra* note 5, at 20 n.38.

Some examples of security applications using the WSDs include perimeter video surveillance, robust wireless secure area monitoring, and childcare monitoring in the home or in childcare facilities.

G. Municipal Broadband Access

Hundreds of municipalities and counties across the nation are already deploying first generation wireless local area networks to provide broadband access to their residents and to make local government services more productive and efficient.[30] Use of the television white spaces for such municipal broadband networks could increase the quality of service and decrease the deployment costs for these networks. For example, Corpus Christi, Texas, which has already deployed an advanced public safety wireless network citywide on current unlicensed spectrum, has been an advocate of unlicensed access to the television band to improve capacity and quality of service.[31]

H. Enhanced Local Coverage and Communications

Local communities could use WSDs to enable mobile video, audio services, and citizen journalism. These services also may provide information of special interest to the local community (e.g., a town hall meeting), coverage of local sporting events (e.g., the high school football game), and new methods for local advertisers to reach customers in a more targeted and valued manner. As WSD technologies become a greater component of next generation wireless microphones and other media equipment, these systems will be substantially less prone to interference than today's "dumb" equipment, that is often incapable of sensing whether other devices are transmitting on the channel they intend to use. In the same way that digital media equipment has spurred a new wave of consumer-generated media, the adhoc and distributed information dissemination networks that WSDs make possible will encourage the sharing of local content and user-generated content.

I. Enterprise Networking

From a base of essentially zero in 2000, an estimated 60 percent of domestic corporations now provide some type of wireless networking using unlicensed spectrum.[32] On May 25, 2006, in testimony

30. *See* Lakshmipathy, *supra* note 25, at 1–2.

31. *Id.* at 3.

32. Telecomms. Indus. Ass'n., TIA's 2006 Telecomms., Mkt. Review and Forecast 188 (2006). For a larger estimate, *see* In-Stat, In-Depth Analysis: Wireless Data in

before the Senate Commerce Committee, Roger Cochetti, Federal Policy Director of the Computing Technology Industry Association (CompTIA),[33] stated that reallocating the television white spaces for unlicensed use "will be used by small business to improve their productivity."[34] Cochetti testified:

> The use of radio spectrum for data services is an absolutely essential part of our industry today . . . . 'White space' frequencies represent prime, largely unused wireless 'real estate.' With their excellent signal propagation characteristics, low-cost broadband deployment using this spectrum should be readily achieved, jump-starting significant new business opportunities and improvements in the productivity and competitiveness of small businesses, urban and rural. Such wireless broadband services will enable small businesses to more easily and cost-effectively employ and network IT, especially in sparsely populated, underserved areas where the economics of broadband deployment sometimes make it impractical for providers to serve. In doing so, 'white space' technology will give America's small businesses a better foot up in the globally competitive environment.[35]

Thus, the operation of unlicensed devices in vacant parts of the television spectrum would provide considerable economic and social benefits to the public. WSDs have the potential to bring affordable broadband to rural residents, provide cost-effective public safety communications networks, enhance mesh and ad-hoc networking, and allow for the creation of any number of personal consumer wireless services and devices.

III.
Obstacles to WSD Development: Opponents' Misinformation Campaign

Opponents of WSDs have crafted a massive misinformation campaign to convince legislators to pressure the FCC to halt their testing

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the Enter: The Hockey Stick Arrives (Dec. 2006), *available at* http://www.instat.com/Abstract.asp?ID=229&SKU=IN0602901MBM.

33. CompTIA's 20,000 members are predominantly among the nation's 32,000 value-added resellers, a $43 billion industry that deploys IT networks for small- to medium-sized businesses and professional offices across the country. The Commc'ns, Consumer's Choice, and Broadband Deployment Act of 2006: Hearing on S. 2686 Before the S. Comm. on Commerce, Sci. & Transp., 109th Cong. 2 (2006) (testimony of Roger J. Cochetti, Group Director, U.S. Pub. Policy, Computer Indus. Tech. Ass'n).

34. *Id.* at 5–6.

35. *Id.* at 5.

regimen.[36] This campaign has included a massive multi-media public relations as well as an extensive lobbying effort, both on the Hill and at the FCC. An unfortunate effect of this campaign has been the propagation of numerous "myths" about white space technologies. While a point-by-point rebuttal of all of these myths is beyond the scope of this article, this section rebuts a dozen of the most prominent criticisms.

MYTH 1: Current uses of television bands are efficient.[37]

FACT: The University of Kansas Center for Research conducted a series of tests of actual spectrum and documented the massive inefficiencies in today's uses of the public airwaves.[38] Researchers measured spectrum use in Great Falls, Virginia; Tysons Corner, Virginia; Arlington, Virginia; New York, New York; Greenbank, West Virginia; and Vienna, Virginia.[39] Even within the television bands, a vast majority of the spectrum remains unused.[40] A New America study found that after full-power television stations switch to digital-only broadcasting in February 2009, the vacancy rate among the 49 channels reserved nationally for digital television (DTV) will range from 20 to 40 percent in congested, coastal markets like Trenton, New Jersey, and up to 80 percent in rural markets, such as Fargo, North Dakota.[41]

36. The Register, Wireless indus. slams NAB's white space 'misinformation' (Jan. 17, 2008), http://www.theregister.co.uk/2008/01/17/wia_nab_white_space_spat; Wireless Innovation Alliance, It's Official – MSTV Stands for Misinformation (Apr. 17, 2008), http://www.wirelessinnovationalliance.org/index.cfm?objtid=72C2D9DC-1D09-317-BB685016D194E78.

37. Opponents of WSDs claim, "the television channels assigned for use by wireless microphone and wireless video assist devices are highly congested in all metropolitan areas. Disruptive interference is the inevitable result of further overcrowding of these existing channels." *See* White Spaces: Myths v. Realities 2, internal talking points memo, on file with N.Y.U. J. Legis. & Pub. Pol.

38. Nat'l Sci. Found., Award #0335272, NRT: Nat'l Radio Networking Research Testbed, http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0335272 (last visited Aug. 14, 2008).

39. *Id.*

40. *Id.*

41. For a survey mapping available white space in selected television markets, *see* New Am. Found., *supra* note 7, at 1, 6. From the report, "TV channel assignments were compiled using a variety of data sources to ensure accuracy. The preliminary channel line-up was taken from the Consumer Electronic Association's 'Antenna Web' online resource (www.antennaweb.org), which lists all available signals from a given zip code. In this case, the base zip code used was downtown Honolulu. CEA's listing was then expanded with data from the Center for Public Integrity's Media Tracker Database (www.publicintegrity.org/telecom/) and the television license query engine at REC Networks (www.recnet.com/cdbs/fmq.php). Each of these databases consists of information taken from the FCC. A final check was performed using the

MYTH 2: Stationary wireless deployments are sufficient to meet consumer needs.[42]

FACT: Fixed wireless (e.g., towers, customer premises equipment) is no substitute for mobility. Cell phones, PDAs, laptop computers, music players and small home electronics are all personal/portable devices in wide use today. The benefits end-users gain by having access to the Internet on a diversity of mobile devices is substantial; adding white space connectivity will generate entirely new services, applications, and innovations in communications technology and "smart" electronics. As more consumers rely on portable wireless devices for their daily communications, the need for spectrum supporting "personal portable" technologies will increase. Accessing the white space between occupied television broadcast frequencies is an efficient and effective strategy to support the future growth of mobile communications technologies.

MYTH 3: WSDs could disrupt the DTV transition.[43]

FACT: The DTV transition to replace all analog television broadcasts with digital television broadcasts will be over before any personal/portable WSD is permitted to operate in the band. The FCC's October 2006 First Order and Further NPRM specifically prohibits the marketing or sale of WSDs until after the February 2009 transition deadline.[44] Moreover, assuming the FCC issues its Final Order prior to the DTV transition, it will take time for manufacturers to build—

FCC's TV TVQ Database Query (http://www.fcc.gov/fcc-bin/audio/tvq.html). FCC databases were also searched to determine if any public safety organizations operated in the television band. This combined station listing was cross-checked with multiple local television guides to determine which channels are available over the air. All stations broadcasting in or near Honolulu that can be viewed over-the-air in the Honolulu area were included. The full list of stations was then searched in the FCC's CBDS database to determine station class and DTV channel selection. In all cases, it was presumed that currently broadcasting channels would remain broadcasting in digital. Channel 37, which is reserved for radio telescopes, was assumed to remain off limits for all other transmitters. Spectrum occupied for producer multimedia use or for other industrial purposes was not included in the white space analysis. All of these pre-existing low-power devices could co-exist without interference in an unlicensed band. Because broadcast transmitters are located at various distances from different parts of the Honolulu area (and therefore have signals that reach different parts of the Honolulu area), it is likely that the white spaces available in the city are greater than this estimate." *Id.* at 9.

42. Optimizing the TV Band White Spaces, http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6519739238 (last visited July 27, 2008).

43. *See* Myths v. Realities, *supra* note 37, at 3 (stating that a new policy on WSDs "during the DTV transition could significantly stall the DTV transition and negatively affect the public interest").

44. First Report, Order, and Further NPRM, *supra* note 18, at 8.

and for the FCC to test and certify—consumer-grade devices. After the transition, since personal/portable WSDs that rely on spectrum-sensing will continuously scan the band for television and wireless microphone signals, both full-power and low-power television licensees will be detected and avoided even if they change channel assignments in the future. Indeed, an advantage of WSDs with sensing capability is that they will immediately detect and avoid a DTV signal, or wireless microphone system, operating on a previously vacant channel.

MYTH 4: Licensing white space spectrum could generate substantial auction revenue.[45]

FACT: Television white space is ill-suited for licensed services and would raise only a small fraction of the revenue expected from unencumbered spectrum (such as the 700 MHz spectrum television channels 52–69).[46] Each of the nation's 210 television markets has a different set of channels in use, meaning there are no nation-wide clear channels.[47] In addition, WSDs—whether licensed or unlicensed—would need to operate at very low power and on a secondary basis to DTV and wireless microphone licensees. This lack of priority, coupled with the lack of geographic scope and very low power levels, creates a novel set of constraints that would dramatically lower the profitability (and thus pricing) of each channel compared to other licensed spectrum. These constraints do not fit the existing business models of companies willing to bid tens of millions, or even billions, for licenses that guarantee quality of service over a national or at least regional service area. Indeed, to protect DTV, the license areas will be the smallest and most encumbered in and around the most densely populated metro markets, concentrated with the most desirable customers. The precedent set by Wi-Fi, on the other hand, demonstrates that unlicensed allocation of seemingly less than desirable spectrum can generate enormous economic activity, ultimately raising far more funding for our public coffers (through sales taxes, increased manufacturing jobs, cost savings to municipal entities, etc.) than licensing.[48]

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45. In the Matter of Unlicensed Operation of the TV Bands, ET Doc. Nos. 04-186, 02-180, Cmts. of Charles J. Jackson & Dorothy Robyn, *available at* http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518724352.

46. In March 2008, the 700 MHz spectrum auction of channels 52-69 raised roughly $20 billion. *See* FCC 700 MHz Band Auction, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-08-595A2.pdf (last visited July 27, 2008).

47. *Id.*

48. Gregory Rose, *The Failure of FCC Spectrum Auctions*, Ctr. for Am. Progress 1, 20 (2006).

MYTH 5: Device manufacturers and proponents of WSDs do not care about the quality of over-the-air television reception.[49]

FACT: Leading advocates of expanding unlicensed spectrum access for broadband and services—such as Consumers Union and the Leadership Council on Civil Rights—have fought for consumer rights for decades, focusing their attention on low-income households who depend upon broadcast television. These advocates are fully committed to maintaining the quality of over-the-air television.[50] As members of PISC wrote in their reply comments in the 04-186 proceedings:

> Opponents to these changes have raised several legitimate, entirely surmountable, concerns. Unfortunately, data and research methodologies introduced into the public record to dissuade the Commission from allowing WSD have been fraught with systemic methodological errors. Careful analysis by the Commission is warranted, particularly when selecting appropriate protection levels for television band devices and services. Yet a balance should also be sought that measures the benefits of WSD for the general public vis-a-vis the myriad requests being made by opponents of WSD to prevent this access. Potential solutions exist to facilitate the successful transition to WSD use. The next step is for the Commission to set explicit and reasonable parameters for the technical specifications for WSDs.[51]

Likewise, the financial self-interest of high-tech firms advocating WSDs dictates that these firms will work to avoid producing television interference, since this problem would inevitably lead to equipment recalls and negative publicity. Many WSD manufacturers also have a financial interest in television markets and likely would prefer not to grow one division at the expense of another. For example, "Prototype B," the WSD that detected DTV signals with 100 percent accuracy in recent tests,[52] was submitted by Philips Electronics, a leading manufacturer of DTV sets.[53] Further, several companies that support white space devices are considering integrating over-the-air

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49. *See* Myths v. Realities, *supra* note 37, at 4–5.

50. *See* Consumers Union*,* Hear Us Now, http://www.hearusnow.org/tvradio/12 (last visited Apr. 7, 2008); *see also* Ryan Post, DTV Transition: One Year Out, http://www.civilrights.org/issues/communication/remote-page.jsp?itemID=33579590 (last visited Apr. 7, 2008).

51. In the Matter of Unlicensed Operation of the TV Bands, ET Doc. Nos. 04-186, 02-180, reply cmts. of New. Am. Found., *available at* http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6519721578.

52. *See infra* notes 64–66 and accompanying text.

53. *See, e.g.*, Philip Drops to #3 in LCD TV Markets, http://www.hidefster.com/HDTV_blog/?cat=50 (last visited July 27, 2008).

television receivers into personal, portable devices.[54] As a result, unlicensed broadband connectivity and DTV reception could one day be integrated side-by-side within the same device, meaning that Philips and other device manufacturers have a tremendous financial incentive in ensuring that the two devices do not interfere with one another. The claim that hardware manufacturers like Philips would support technologies that would harm their television sales, or that public interest groups—like the National Hispanic Media Coalition and the Leadership Council on Civil Rights—would advocate changes that directly harm the constituents they serve, lacks logical merit.

MYTH 6: WSDs must be able to sense at or below -116 dBm to ensure interference caused by WSDs does not harm television broadcasts.[55]

FACT: Public interest groups and independent engineers maintain that a sensitivity level in the range of -110 to -115 dBm will be more than adequate to protect television receivers given a transmit power cap of 100 mW for personal/portable devices.[56] Researchers base this assessment upon findings published by the New America Foundation, showing this range to be adequate for receiver protection.[57] The IEEE 802.22 working group, which focuses on Wireless Regional Area Networks, is considering a sensing threshold of -116 dBm for fixed-location broadband equipment (such as access points) that will generally be transmitting at higher power levels than personal/portable devices and from locations well above ground level (e.g., on towers, rooftops or lamp posts), where they are more likely to interfere with DTV antennae.[58] The White Spaces Coalition,[59] comprised of numerous high-tech firms, including the companies who

54. Barry Levine, CIO Today, FCC Will Again Test TV "White Spaces" for Broadband (Jan. 21, 2008), *available at* http://www.cio-today.com/story.xhtml?story_id=0120013I60W0.

55. *See In re* Unlicensed Operation of the TV Broadcast Bands, ET Doc. Nos. 04-186, 02-380, reply cmts. of MSTV and NAB, *available at* http://www.nab.org/AM/Template.cfm?Section=Filings1&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=10336.

56. *See* Sanjay Talwani, FCC Defends White Space Tests (Sep. 5, 2007), *available at* http://www.tvtechnology.com/pages/s.0082/t.8265.html.

57. Mark A. Sturza and Farzad Ghazvinian, White Space Technical Study: Can Cognitive Radio Operating in the TV White Spaces Completely Protect Licensed TV Broadcasting? (Jan. 29, 2007), *available at* http://www.newamerica.net/publications/policy/can_cognitive_radio_operating_in_the_tv_white_spaces_completely_protect_licensed_tv_broadcasting.

58. *See* O. Bendov, Limits on Fixed Broadband Devices for Interference-Free Operation in the DTV Spectrum 1 (2007), *available at* http://www.tvantenna.tv/papers/Limits_on_BD_final.pdf.

built the first two prototypes tested by the FCC, has proposed a somewhat less sensitive detection threshold of -114 dBm for very low-power personal/portable devices.[60] This proposed threshold is far more sensitive than needed to detect and avoid transmissions at -83 dBm, the frequency required by televisions to project an image.[61]

Additionally, demanding overly-sensitive equipment risks selling short the potential of white space devices by restricting the available spectra more than necessary to ensure interference-free broadcasts. The final choice of DFS sensitivity number depends on many factors, particularly the maximum allowed transmit power, transmission mask, and treatment of adjacent channel issues. Creating overly protective WSD reception sensitivity standards (e.g., requiring a level weaker than -114 dBm) will result in far less available white space and will create situations where WSDs cannot use frequencies that a television would not be able to use effectively in the first place (for example, by unnecessarily protecting an out-of-area signal, which would not otherwise be displayed because of its low, diluted strength). Even a -114 dBm threshold is so protective of distant television signals (receivable only by a handful of viewers with expensive, roof-mounted directional antennas) that large quantities of spectrum would remain unusable by television broadcasters and unnecessarily blocked from WSDs.[62]

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59. *See* Eric Bangeman, The White Space Coalition's Plans for Fast Wireless Broadband (Apr. 17, 2007), *available at* http://arstechnica.com/articles/paedia/hardware/white-space.ars.

60. *See* Consumers Union, The Digital Television Transition: It Affects More People Than You Think 9 (2008), *available at* http://www.hearusnow.org/fileadmin/site content/DTV_HH_Report_Final.pdf.

61. *See* Janine Love, Tuner Leads DTV Spec Race, (Mar. 8, 2006), *available at* http://www.eeproductcenter.com/rf-micro/review/showArticle.jhtml?articleID=18150 1995 (noting the power level required for television broadcast reception). The 30 dB difference between a TV broadcast and the WSD reception sensitivity means that a TV set, to show a picture, uses a signal that is 1,000 times stronger than the weakest signal that a WSD can detect. While external noise and propagation degradation slightly decrease sensitivity, a WSD's detection capabilities are still within limits. *Id.*

62. According to the Nat'l Ass'n of Broadcasters, in 2004, less than 19 percent of households received over-the-air TV broadcasts only. *See* David Gunzerath, Estimates Related to Broadcast-Only TV Households and Sets, and DTV Households with Over-the-Air Digital Broadcast Reception Capabilities 3 (2004), *available at* http://republicans.energycommerce.house.gov/108/Hearings/02172005hearing1435/Yager%20Attachment.pdf. The Consumers Union found that, by 2008, the percent of consumers relying on over-the-air transmissions had decreased to 15 percent. *See* Consumers Union, 74 percent of Consumers Who Know About Digital TV Transition Have Major Misconceptions, Consumer Reports Survey Finds (Jan. 30, 2008), *available at* http://www.consumersunion.org/pub/core_telecom_and_utilities/005383.html.

MYTH 7: WSDs will not adequately sense channels occupied by licensed television broadcasters.

FACT: Recent laboratory testing conducted by the FCC's Office of Engineering and Technology (OET) shows that Philips Electronics' "Prototype B" WSD reliably detects and avoids DTV signals at extremely low power levels (-114 dBm[63]), a signal level far below a theoretical -85 dBm threshold needed for a television to display a broadcast.[64] Indeed, the Philips "Prototype B" was 100 percent successful at sensing occupied TV bands at the weakest signal level within the device's technical specifications (-114 dBm).[65] The FCC also measured how well the device operated at even weaker, out-of-spec measurements of -116 dBm, -117 dBm, -118 dBm, and -119 dBm.[66] Opponents of WSDs only reported the results at -116 dBm, choosing to ignore the perfect performance of "Prototype B" at -114 dBm.[67]

63. dBm – "decibel milliWatt" – is a power measurement for electromagnetic transmissions. Michael F. Young, Understanding Decibels and Their Use in Radio Submissions, http://wireless.fcc.gov/outreach/2004broadbandforum/comments/YDI_understandingdb.pdf (last visited Apr. 15, 2008). The scale is logarithmic, like decibels. *Id.* 0 dBm is equal to 1mW (1/1000th of a Watt). 3 dBm is roughly equal to a doubling of power (i.e., 3 dBm is about 2mW) and -3 dBm is roughly equal to a halving of power (i.e., -3 dBm is roughly 0.5mW). By comparison, a typical cell phone transmitter operates at 27 dBm or roughly 500mW. BlueTooth tends to operate at roughly 20 dBm (100mW). -114 dBm is slightly less than .005pW or roughly 0.00000000000005 percent of a Watt. The "Prototype B" White Space Devices are able to measure signals of this strength 100 percent of the time. Prototype B Initial Evaluation, *supra* note 3 (explaining that Prototype B experienced a 100 percent success rate detecting signals on three different television channels at a sensitivity of -114 dBm). In fact, WSDs can measure broadcast signals at levels that are 1/1000th the power level needed for a television to actually display a picture. *Id.* During the FCC Office of Engineering & Technology testing, the Philips prototype had a 100 percent success rate of detecting occupied television stations down to -115 dbm, which was outside the device's technical specification of -114 dBm reception sensitivity. *Id.*

64. *Id.* at viii. .

65. *Id.* at 14, 18 (showing, in figures 3-4 and 3-8, Prototype B's detection capabilities).

66. These signal power levels are near the noise floor for the frequencies that are tested – in essence, at these levels, the WSDs must be able to measure signal strengths that are equal to (and sometimes less discernible) than the naturally occurring background "noise."

67. *See, e.g.*, Nat'l Ass'n of Broadcasters, FCC Testing Reveals "White Space" Interference (Aug. 1, 2007), *available at* http://www.nab.org/AM/Template.cfm?Section=Position_Statements1&CONTENTID=9976&TEMPLATE=/CM/ContentDisplay.cfm ("Commenting on the FCC testing results, NAB Executive Vice President Dennis Wharton said, 'FCC testing results confirm what NAB, MSTV and others have long contended: that the portable, unlicensed devices proposed by high-tech firms can't make the transition from theory to actuality without compromising interference-free television reception.'"). In proclaiming the devices' failure, Mr. Wharton, unfortunately, refers only to the test results at 116 dBw. *See id.*

While broadcast industry lobbyists have attempted to convince newcomers to the discussion that WSDs cannot work,[68] these WSD detractors have systematically ignored data showing that WSDs work perfectly at their intended design specifications. As discussed above, WSDs do not need to detect and avoid out-of-area signals. That goal would be impossible and unnecessary. This figure[69] shows the view of the National Association of Broadcasters (NAB) that white space devices do not accurately detect television broadcasts at -116 dBm,[70] a level far more sensitive than is necessary or was anticipated by the prototypes submitted to FCC for testing earlier this year:

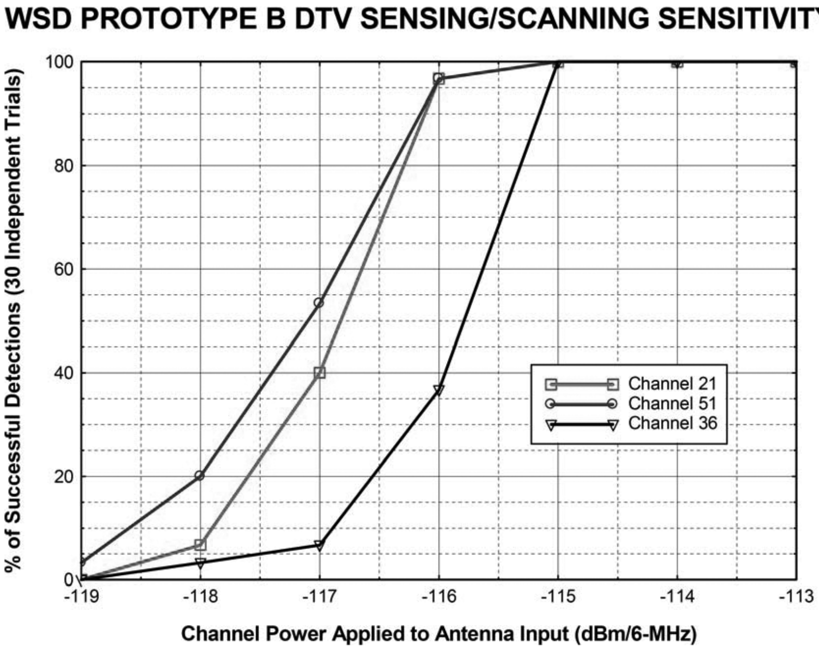

FIGURE 3-4. BASELINE DETECTION THRESHOLD RESULTS FOR PROTOTYPE B.

As the figure indicates, NAB's own data concedes that the WSD Prototype B worked perfectly at -115 dBm, a level more sensitive than the -114 dBm design specification.[71]

68. In the Matter of Unlicensed Operation of the TV Bands, ET Doc. Nos. 04-186, 02-180, reply cmts. of MSTV and NAB [hereinafter MSTV and NAB Comments], *available at* http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6519611393.

69. *See* Prototype B Initial Evaluation, *supra* note 3, at 14.

70. *Id.* at 6–7.

71. *Id*.

MYTH 8: WSD transmissions will cause harmful interference to television broadcasts on immediately adjacent channels.

FACT: Along with the partial success and great promise of the prototypes tested by the FCC, engineers at the University of Kansas have built and tested a prototype WSD transmitter that successfully structures WSD transmissions to avoid causing harmful interference to licensed broadcasts on adjacent channels.[72]

On January 31, 2007, the University of Kansas' Information and Telecommunication Technology Center (ITTC) released a study commissioned by the New America Foundation to create and test transmissions from WSDs.[73] The study concluded that by combining a number of basic interference-reducing features, WSD transmitters operating at under 100 milliwatts (mW), such as 20 dBm, did not cause harmful interference to TV broadcasts on neighboring channels.[74] Wireless experts from across the country reviewed these test results and agreed with the study's findings, filing comments in support of this research with the Commission.[75] Subsequent measurements at the ITTC labs show how a properly designed WSD "transmission mask"[76] can operate at low power on the channel immediately adjacent to an occupied channel, effectively blocking interference, just as two high-power DTV stations operate today without interference on immediately adjacent channels in Lawrence, Kansas.[77] As current FCC testing continues, this research may become a vital part of the public record in support of WSD technology.

72. *The White Open Spaces: The FCC Should Allow Unlicensed Use of Unused TV Band Spectrum, When and If the Technology Is Ready*, WASH. POST, Aug. 16, 2007, at A14.

73. *See* Daniel DePardo, Univ. of Kan. Info. & Telecomm. Tech. Ctr., Quantifying the Impact of Unlicensed Devices on Digital TV Receivers (2007), *available at* http://www.newamerica.net/files/NAF%20Spectrum%20Technical%20Report%20_FINALSUBMITTED_0.pdf.

74. *Id.* at 10.

75. In the Matter of Unlicensed Operation of the TV Bands, ET Doc. Nos. 04-186, 02-180, cmts. of New. Am. Found. [hereinafter NAF Tech. Cmts.], *available at* http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518724361.

76. A transmission mask, also known as a spectral or emission mask reduces adjacent channel interference by limiting or attenuating spurious emissions outside the designated boundaries of a frequency band or channel.

77. *See* NAF Tech. Cmts., *supra* note 75, at 19–20.

MYTH 9: Unlicensed devices will harm existing television broadcasts.[78]

FACT: Devices comparable to WSDs have successfully used television bands without causing interference for years. Opponents of white space devices neglect the fact that wireless microphones, the vast majority of which are themselves quasi-unlicensed devices that have used vacant television channels for many years (most of them illegally), have spurred almost no complaints of interference.[79] Today's "smart" radio technologies already are proven and can be used to sense and avoid both high-power broadcasters and relatively low-power wireless microphone systems, such as those used at major concerts and sports stadiums. "Listen before talk" sensing is a well-established radio technology[80] already operating to the Pentagon's satisfaction in the 5 GHz band, allowing "smart" Wi-Fi devices to share the band with military radar.[81] The technology is also central to the military's DARPA XG initiative, which has shown that "smart" radios can identify and share spectrum white space across wide ranges of frequencies anywhere in the world.[82]

Although the broadcast and wireless microphone lobbies have attempted to distinguish between these success stories and the case of WSDs by emphasizing that one of the prototypes tested by the FCC failed to detect weak signals, the success of the Philips "Prototype B" was sufficient to prove the feasibility of the technology. While it is true that the Microsoft "Prototype A" failed to perform well, evidence suggests that the device was broken during testing.[83] In fact, when the FCC tested an identical, functioning Microsoft device, those tests demonstrated that when the device was not broken, it was able to detect incumbent television operations using the proposed detection threshold of -114 dBm.

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78. *See* Myths v. Realities, *supra* note 37.

79. *See* NAF Tech. Cmts., *supra* note 75, at 19–20.

80. *See* Jim Zyren, Director of Strategic Marketing at Intersil Corporation, IEEE 802.11g Explained (Dec. 6, 2001), *available at* http://forskningsnett.uninett.no/wlan/download/WP_IEEE802gExpla_12_06.pdf (explaining the "listen-before-talk" mechanism) (last visited Aug. 14, 2008).

81. *See* Rob Schneiderman, High-Flying Defense Systems Poised to Take Off (Jun. 16, 2003), *available at* http://electronicdesign.com/Articles/ArticleID/5073/5073.html (explaining the use of spectrum-sensing technology in next-generation warfare technologies).

82. *Id.*

83. FCC, http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6519610797 (last visited Apr. 15, 2008).

MYTH 10: Unlicensed WSDs will broadcast in unassigned television channels that wireless microphones currently use.

FACT: Many options are available to venues that rely upon wireless microphones (such as professional theaters and sports organizations). First, the capacity to automatically sense frequencies utilized by wireless microphones is being integrated into prototype WSDs themselves, allowing them to prevent harmful interference.[84] Second, the FCC's original 2004 notice of proposed rulemaking stated that venues can require patrons to turn off their cell phones and other wireless devices, much like theaters, airlines, and other venues specifically request today, neatly circumventing the issue.[85] However, it also should be noted that licensed microphone systems operate at considerably higher power than WSDs (up to 250mW, compared to the proposed 100mW maximum power for WSDs),[86] meaning a WSD often would need to be in close proximity to a microphone receiver to cause interference. Alternately, the FCC could allow licensed microphone operators to protect themselves by using an inexpensive beacon device to broadcast a signal at the DTV pilot tone frequency (for which WSDs are listening), which would cause WSDs within range to avoid those channels during the event. Finally, other innovative solutions are available. For example, the United Kingdom has proposed setting aside specific frequencies for wireless microphone use during the DTV transition,[87] and if wireless microphone manufacturers need more spectrum space, they can lease or buy access to extra service bands, like any other industry.[88]

84. Unlicensed Operation in the TV Broadcast Bands: Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GG/Hz Band, First Report and Order and Further Notice of Proposed Rulemaking, 21 F.C.C.R. 12266, 12279 (2006) (noting the potential success of spectrum sensing devices, following further inspection), *available at* 2006 FCC LEXIS 557, *43–46.

85. Unlicensed Operation in the TV Broadcast Bands: Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GG/Hz Band, Notice of Proposed Rulemaking, 19 F.C.C.R. 10018 (2004), *available at* 2004 FCC LEXIS 2772, at *55–56.

86. *Id.*

87. *See* OFCOM, *supra* note 26, at 87 (explaining a safe haven exclusively for wireless microphone use).

88. *See* Gary Tonge & Pierre de Vries, *The Role of License-Exemption in Spectrum Reform*, 67 Comms. & Strategies 85, 99 (2007), *available at* http://www.pierredevries.com/docs/CS67_TONGE_VRIES.pdf.

MYTH 11: The OET feasibility testing completed this year is the same as FCC device certification.[89]

FACT: Feasibility testing is a precursor to certification, laying the groundwork for certification by aiding the FCC as it develops technical specifications. Certification, on the other hand, is a rigorous process ensuring that devices will operate pursuant to the actual technical specifications for interference avoidance.[90] Unlike FCC device certification, recent OET feasibility testing focused on gathering data to determine whether WSD technologies were feasible for personal and portable uses and under what parameters these devices could operate. Ideally, these parameters will sketch the outlines of the standards and rules that the FCC would use to certify these devices.[91]

MYTH 12: More time is needed to study the viability of these technologies before the FCC creates technical specifications.[92]

FACT: The Pentagon has shared military radar spectrum by unlicensed devices using detect-and-avoid "smart" radio technologies in their DARPA XG program with great success.[93] In addition, in the FM radio bands, unlicensed transmitters have been in use for years. Products like the iTrip allow anyone to broadcast from their iPod to their car or home radio over vacant FM channels.[94] Further, legislative initiatives to increase unlicensed device usage of white space have had some success. In June 2006, the Senate Commerce Committee adopted "The Advanced Telecommunications and Opportunity Reform Act," an initiative to require the FCC to allow unlicensed devices to utilize all unused spectrum in the television band, subject to interference protections for licensed incumbents.[95] Ultimately, given mili-

89. NAB continues to press white space opposition, http://www.rbr.com/tv-cable/4176.html (last visited July 27, 2008).

90. *See generally* FCC, Understanding the FCC Regulations for Computers and Other Digital Devices (OET Bulletin No. 62) 5 (1993) (outlining the certification process and its rigor), *available at* http://www.fcc.gov/oet/info/documents/bulletins.

91. FCC, Office of Eng'g & Tech. Announces Plans for Conducting Measurements of Additional Prototype TV White Space Devices, 23 F.C.C.R. 417, 417–18 (Jan. 17, 2008), *available at* 2008 FCC LEXIS 687, at *1–4.

92. *See* Myths v. Realities, *supra* note 37, at 4.

93. *See* Schneiderman, *supra* note 81, (explaining spectrum sensing technology usage in the XG Program).

94. *See* iTrip: Listen to Your iPod Through Your Radio, http://www.griffintechnology.com/products/itrip (last visited Apr. 11, 2008).

95. *See* Advanced Telecomms. & Opportunities Reform Act, S. 2686, 109th Cong. (2006); *see also* Benton Foundation, http://www.benton.org/?q=node/3292 (explaining the proposed Act and its most recent status) (last visited July 27, 2008).

tary and consumer uses of WSDs and the initial legislative success surrounding WSD initiatives, spectrum sensing is a proven and well-understood technology ripe for increased real-world applications.

Conclusion

The time to begin using and benefiting from our vacant white space is now. Extensive feasibility tests confirm that WSDs can and do work.[96] Vocal in their support of rigorous testing for WSDs, public interest groups are committed to the ultimate goal of certifying useful new wireless technologies that operate within television bands without causing harmful interference to licensed users. As such, a new round of FCC feasibility testing is currently underway that will add even greater support for the viability of WSD technologies.[97] The next step will be for the FCC to issue the necessary technical specifications for WSDs based upon the empirical data collected during feasibility testing and regulatory precedent. The FCC subsequently will certify consumer devices, ensuring that those devices meet required technical standards. Only after all three phases of this process are complete, will consumer WSDs be available to the general public. Taken together, this multi-step process will ensure that WSDs co-exist with current license holders without causing harmful interference and that manufacturers and implementers will have the flexibility to develop new features and innovative uses for WSDs.

WSDs represent the future of wireless communication technology, providing more affordable broadband access, cutting-edge public safety communications, and a plethora of new personal consumer services and devices. Given these substantial economic and social benefits, the FCC should proceed in a manner that judges WSDs based on the merits of scientific testing and not on myths perpetrated by incumbent broadcasters, who have demonstrated a desire to warehouse spectrum for their own exclusive uses. Technological progress – and the social and economic promise WSDs hold – demands that we not cave to the misinformation and special interests of the powerful few.

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96. *See supra* Section III (explaining the success of the spectrum-sensing capabilities of white space devices).

97. *See* Press Release, Shure, White Spaces Overview, http://www.shure.com/ProAudio/PressRoom/WhiteSpaces/us_pro_pr_whitespacespage (last visited July 27, 2008).