

Before the

**NATIONAL TELECOMMUNICATIONS  
AND INFORMATION ADMINISTRATION**

Washington, D.C. 20230

In the Matter of	)	
	)	
Implementation and Administration of a	)	Docket No. 06051 21 29-61 29-01
Coupon Program for Digital-to-Analog	)	
Converter Boxes	)	
	)	

**COMMENTS OF**

**NEW AMERICA FOUNDATION  
 MEDIA ACCESS PROJECT  
 CONSUMER FEDERATION OF AMERICA  
 WIRELESS INTERNET SERVICE PROVIDERS ASSOCIATION (WISPA)  
 ACORN ACTIVE MEDIA FOUNDATION  
 COMMUNITY TECHNOLOGY CENTERS' NETWORK  
 CHAMPAIGN URBANA COMMUNITY WIRELESS NETWORK (CUWiN)  
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**Introduction**

For close to a generation, telecom policy analysts have argued that the TV broadcast band was extremely inefficiently utilized and that parts of it should be reallocated for more efficient uses.<sup>1</sup> In recent years, Congress and the FCC have taken steps on two fronts to minimize the opportunity cost

of this inefficient use: (1) to facilitate the use of unused spectrum (white spaces) between channels 2 and 51 by unlicensed devices, and (2) to accelerate the DTV transition and return by broadcasters of channels 52 to 69. With respect to (1), in 2004, the FCC introduced a Notice of Proposed Rulemaking to open up the white spaces between TV channels 2 and 51 for unlicensed use. Earlier this month, the FCC released a Public Notice which lays out a one-year timeline to complete the proceeding. This comes in response to possibility of congressional action encouraging the opening of TV band white space to unlicensed use, and requiring the FCC to complete its Rulemaking (the Senate Commerce Committee recently approved such legislation, which is now awaiting a vote before the full Senate).<sup>2</sup> With respect to (2), in late 2005, Congress passed a “hard deadline” for the DTV transition, requiring that TV broadcasters return 108 MHz of spectrum (TV channels 52 to 69) by February 18, 2009.<sup>3</sup>

This NPRM has a direct bearing on both of these goals. First, the quality of the converter boxes NTIA mandates will affect the utility of the white spaces within TV channels 2-51. The stakes in enabling use of TV band white spaces by unlicensed devices are critical. The desirable propagation characteristics of TV band spectrum make the white spaces ideal for the deployment of high-quality, affordable fixed and mobile wireless broadband services, particularly in rural areas where such services are vitally needed and where the most TV band white space exists. Fostering the deployment of affordable and ubiquitous wireless broadband services will allow more households and businesses to access the Internet, and will carry enormous benefits for small business productivity, as well as for government efficiency, public safety, and education. Opening up more unlicensed spectrum will provide a new hotbed for innovation in wireless services.

Second, the design of the of the converter box subsidy NTIA mandates will affect whether those currently dependent on analog TV sets can transition to digital TV with minimal disruption, the *raison d'etre* for the converter box subsidy and a goal Congress has deemed essential for completing the return of TV channels 52 to 69.

***The minimum technical capabilities for the converter boxes should maximize the utility of the TV white spaces within channels 2-51 for broadband and wireless innovation.***

The NPRM invites comment on “the appropriate minimum technical capabilities for the converter boxes.” In its NPRM on “Unlicensed Operation in the Broadcast Bands” (Docket 04-186), the FCC expressed concern that low-quality DTV receivers could severely impact the utility of the white spaces within TV channels 2-51. Historically, the NTIA’s Office of Spectrum Management has been more concerned about receiver standard issues and their impact on spectrum management than the FCC has been, and has repeatedly urged the FCC to adopt receiver regulations. In its NPRM on “Interference Immunity Performance Specifications for Radio Receivers” (Docket 03-65), the FCC has more generally recognized the critical importance of minimum receiver standards to prevent incumbent licensees from polluting the guard band spectrum. Broadcasters themselves have in numerous proceedings argued that the quality of generally available receivers can impact the use of guard band spectrum for competing purposes.<sup>4</sup> The NTIA should thus carefully consider setting minimum receiver standards with the goal of maximizing the overall utility of the broadcast band spectrum. This is especially critical, given that the primary use of unassigned TV guard band channels (white space) will be for the deployment of more affordable fixed and mobile wireless broadband networks, and other wireless innovation.

TV tuners come in a variety of performance ability with respect to their susceptibility to interference. NTIA has traditionally been more cognizant of this issue than the FCC and has in the past repeatedly

urged the FCC to address receiver standards for interference immunity. Thus, it is appropriate that NTIA adopt technical standards for converters that are at least as good as industry technical standards for stand-alone TV sets presently sold in stores such as Circuit City and Best Buy. In view of the fact that converter boxes are more likely to be used with over-the-air signals than stand alone TV sets,<sup>5</sup> a good public interest argument could be made that the converters should be better than stand alone sets.

FCC testing in 2005 provides a sample of the receiver performance for currently available tuners. The performance for parameters of interest varies widely. The noise figure varies (best to worst) by 14.7 dB with average deviation of 7 dB. The minimum detectable signal at TOV (threshold of visibility) spans 15 dB with typical deviation of

7.6 dB.<sup>6</sup> Using the 90<sup>th</sup> percentile receiver (that is, 90% of the receivers are superior in performance) would have the following characteristics (this is a partial list):

**Table 1: 90th Percentile Receiver Characteristics**

<ul style="list-style-type: none"> <li>• Minimum Signal Level at TOV           <ul style="list-style-type: none"> <li>○ Channel 3: -77.0 dBm</li> <li>○ Channel 10: -83.0 dBm</li> <li>○ Channel 30: -82.5 dBm</li> </ul> </li> <li>• White Noise S/N Threshold           <ul style="list-style-type: none"> <li>○ 15.6 dB</li> </ul> </li> <li>• Noise Figure           <ul style="list-style-type: none"> <li>○ Channel 3: 13 dB</li> <li>○ Channel 10: 11 dB</li> <li>○ Channel 30: 8 dB</li> </ul> </li> </ul>
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*Note:* White Noise S/N Threshold and Noise Figure values were presented in the report in units of dBm. It is most likely that is a misprint which is corrected in this table.

However, there can be additional goals for the converter box such as enabling the use of the TV “white space.” The FCC approved a Notice of Proposed Rulemaking (NPRM) proposing to allow a new generation of wireless devices to utilize vacant television channel frequencies in each market. This so-called TV band “white space” consists of frequencies that are allocated for television broadcasting but are not actually in use in a given area.<sup>7</sup> After the completion of the DTV transition—and the reallocation of TV channels 52-to-69 for auction and public safety uses—an average of only seven full-power DTV stations will be operating on channels 2-to-51 in the nation’s 210 local TV markets. Only 42 MHz of the 294 MHz of prime spectrum allocated to DTV services will actually be utilized on average.<sup>8</sup> That represents less than 15% of the spectrum that has highly desirable propagation characteristics. Currently, there are no mandatory receiver standards that are imposed on DTV receivers. Thus, there is an opportunity for the Department of Commerce to enable

the utilization of part or most of the remaining 85% of the spectrum by careful definition of the receiver operational parameters.

The NPRM mentions technical quality of receivers in passing, but does not appear to give any firm requirement. In particular, the NPRM states:

*NTIA proposes to take into consideration the cost (i.e., inexpensive but meets the ATSC Recommended Practice: Receiver Performance Guidelines standard (A/74) of the converter box as well as the ease of installation and operation.* <sup>9</sup>

However, the NPRM does not explicitly state that the industry consensus performance standards in ATSC A/74<sup>10</sup> are mandatory standards. We urge NTIA to make the ATSC A/74 standards mandatory for the converter boxes as these are the performance standards that the broadcast industry and the receiver industry have agreed as necessary for adequate performance and were used by the FCC in making the allotment plan. In particular, we urge NTIA to require, at the very least, the DTV-into-DTV adjacent channel performance given ATSC A/74, which is shown below as Table 2.

Table 2: First adjacent channel threshold as provided in the ATSC Recommended Practices (ATSC A/74).

Type of Interference	Adjacent Channel D/U Ratio (dB)		
	Weak Desired (-68 dBm)	Moderate Desired (-53 dBm)	Strong Desired (-28 dBm)
Lower DTV interference into DTV	-33 <sup>5</sup>	-33 <sup>6</sup>	-20
Upper DTV interference into DTV	-33	-33 <sup>6</sup>	-20
Lower NTSC interference into DTV	-40	-35	-26
Upper NTSC interference into DTV	-40	-35	-26
<i>Note:</i> All NTSC values are peak power; all DTV values are average power.			

With this adjacent channel rejection there is the real possibility that the converters may fail to receive a local station due to the presence of a strong signal in the adjacent channel. The NTSC into DTV rejection goals are also desirable but are of lower priority since the presence of NTSC signals in these bands is transient. This adjacent channel rejection will also prevent interference from public safety signals authorized under US footnote NG66 and Broadcast Auxiliary signals authorized under 47 CFR §§74.861,870.

In addition to the adjacent channel rejection goals of A/74, there is the issue of desensitization immunity, highlighted recently in a video entitled “Your Neighbor’s Static,” made by the Association for Maximum Service Television (MSTV).<sup>11</sup> This video highlights the fact that consumer grade receivers, including the converters in this proceeding, which have both wide tuning range and high sensitivity, can be overloaded by signals anywhere in the TV band unless attention is paid to this issue in the design. Although the MSTV video focused on this interference being caused by unlicensed devices under consideration in Docket 04-186, clearly the same interference could be caused by any transmitter that creates a strong signal at the receiver or converter, such as a nearby

TV transmitter, a public safety transmitter operating in channels 14-20, a transmitter operating just above channel 51, or a broadcast auxiliary (FCC Part 74) transmitter. Thus, we believe that the technical performance goals should not be limited to the adjacent channel parameters given in ATSC A/74 but must also include desensitization performance. At the very minimum, the desensitization performance of the converters should be equivalent to most of the stand alone TV sets presently marketed.

Although we have referenced guidelines that should be used for defining the receiver operational characteristics, explicit and detailed engineering measurements would be the optimal method to determine the values of receiver operational requirements and/or receiver standards. Detailed engineering measurements as to the susceptibility of current DTV receiver designs to interference from out-of-band signals are needed. Currently, both the FCC<sup>12</sup> and non-governmental organizations<sup>13</sup> are performing detailed engineering measurements in order to accurately determine these parameters. The FCC is scheduled to report these results by July 2007, which is problematic for this inquiry. However, the University of Kansas measurement is ongoing and results pertinent to this inquiry should be available by 15 October 2006. It is highly desirable that NTIA delay any quantitative decision as to the technical requirements for the converter boxes until these data become available.

Another alternative to waiting for engineering interference testing results is to implement receiver requirements. The NTIA should explicitly require either the ATSC recommended values for thresholds on interference from the first adjacent channel or more stringent values such as 40 dB for weak desired signals. The specific implementations to meet these requirements<sup>14</sup> may include improved preselect filtering and/or selection of appropriate low-noise amplifiers. Tradeoffs between insertion loss and noise figure will impact the selection of the particular implementation of multiple filter-gain blocks (tunable filters / low-noise amplifiers) and/or switched filter banks.

The cost of such separate devices is difficult to estimate without specific designs and implementation strategies. However, these components can be integrated directly into the design. Thus, in large quantities (>10 million), the marginal cost can be small (\$0-2). The goal is to minimize the direct cost to the consumers and the US government while maintaining the utility of the expected white space, which constitutes 85% of the DTV spectrum.

***The Primary Goal in Designing the Converter Box Subsidy Should be to Ensure that the Return of TV Channels 52-69 is Not Endangered as a Result of Inadequate Distribution of Converter Boxes to Eligible Households***

The central driving force leading Congress to create a converter box subsidy program was to speed the DTV transition, thus putting 108 MHz of the most valuable spectrum (TV Channels 52-69) into productive use. Using the results of the recent AWS auction as a benchmark, that 108 MHz of spectrum has a minimum market value of approximately \$16 billion. The reason for describing this as a "minimum" is that the AWS auction involved higher frequency, less valuable spectrum. The most recent FCC valuation of lower frequency spectrum near the 700 MHz band suggests a valuation closer to \$54 billion. Moreover, as the *9/11 Commission Report* highlights so vividly, returning this spectrum is vital for public safety.<sup>15</sup> Whether the spectrum is worth \$16 billion or \$54 billion, something in between, or is priceless because it might save hundreds of thousands of lives, the converter box program must be viewed as an investment leading to a fantastically large return. In other words, the overwhelming purpose of the converter box subsidy is to ensure that the people who need to get the converter boxes get them so that the far larger benefit from opening channels 52-69 in

a timely way can be realized.

The design of the converter box program surely presents the NTIA with uncertainty and risk. One risk is that the NTIA will run out of funding for the converter box program due to an unexpectedly large number of people applying for converter box coupons. But this risk must be weighed against not getting converter boxes into the right hands and thus creating great political pressure to delay the DTV transition. A too narrow focus on ensuring that the converter box program does not run out of funds could thus endanger the larger purpose of the converter box program.

In particular, NAF, *et al.* is concerned that the NTIA, in trying to ensure that it does not run over budget, will make it too difficult for consumers to acquire and redeem coupons. Making it as easy as possible for eligible households to acquire the coupons involves two major components: making it easy for them to get information about the program and making it easy for them to fill out an application for the converter box coupon.

The NTIA's consumer education budget is \$5 million and appears to be geared to mass media advertising. NAF, *et al.* believes that, in addition to a mass media education campaign, all U.S. households should receive a postcard in the mail alerting them to the existence of the converter box program and telling them how, via mail, telephone, or the Internet, they might apply for the converter box coupon application. Furthermore, the postcard should include a unique number linked to the address, so that all that is necessary to get a mailed application is to enter this number. The unique number should not be necessary to get an application. It should just be used as an option to facilitate consumer access to application forms.

Since the NTIA has no way to distinguish between eligible and ineligible households, it must send this postcard to all U.S. households and budget accordingly. To minimize the administrative and retail burden of sending out all the postcards at once and being inundated with too many consumer requests at one time, the NTIA may want to stagger the mailings—but not at the price of undue delay in getting them out. The NTIA should let retailers know when the postcards are going out in a particular area so they will be able to have adequate inventory of converter boxes in stock. The NTIA should also carefully coordinate the consumer education campaign with the mailing of the postcards so that consumers are given advance warning that they will be getting such postcards in the mail.

Given the practical impossibility of narrowly targeting eligible households in the consumer education effort, the effort should be targeted broadly. But special attention should be given to zip codes with low income consumers, since these are the communities that may most benefit from the converter box subsidy.

We applaud the NTIA for proposing that consumers be allowed to acquire coupon applications via mail, telephone, and the Internet. We also applaud the NTIA for allowing consumers to submit applications via both the mail and the Internet. For those consumers who wish to apply via the mail, the application should include a postage prepaid, pre-addressed envelope so that after the application is filled out the consumer can easily send it in the mail. This type of ordering process is standard for private sector organizations and is a standard of customer service that should be striven for here as well.

Finally, the NTIA should carefully consider giving the converter boxes the capability of receiving software downloads to repair software problems and make necessary updates for EAS, V-chip, and captioning capabilities, with one acceptable method being that specified in ATSC A/97. Converter boxes are essentially small computers and may suffer from some of the same reliability problems as

computers. If a software update function can be provided using a genuinely open standard and with minimal cost (under \$1/box) and minimal risk of security breach, it should be provided.

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## COMMENTING PARTIES

**Acorn Active Media Foundation** engages in software, website and technical development in support of the global social and economic justice movement.  
[www.acornactivemedia.com](http://www.acornactivemedia.com)

**The Champaign-Urbana Community Wireless Network** (CUWiN), a project of the Urbana-Champaign Independent Media Center Foundation, has deployed an extensive mesh network using Part 15 spectrum in the Champaign-Urbana metro area. The three-part mission is to (a) connect more people to Internet and broadband services; (b) develop open-source hardware and software for use by wireless projects world-wide; and, (c) build and support community-owned, not-for-profit broadband networks in cities and towns around the globe.  
[www.cuwireless.net](http://www.cuwireless.net)

**Consumer Federation of America** (CFA) is the nation's largest consumer advocacy group, composed of two hundred and eighty state and local affiliates representing consumer, senior citizen, low-income, labor, farm, public power and cooperative organizations, with more than 50 million individual members. [www.consumerfed.org](http://www.consumerfed.org)

**The Community Technology Centers' Network** (CTCNet) is a national membership network of community technology centers (CTCs) and other non-profits, united in their commitment to provide technology access and education to underserved communities.  
[www.ctcnet.org](http://www.ctcnet.org)

**The Ethos Group** is a telecommunications consulting firm focusing on the community benefits of wireless technology.  
[www.ethoswireless.com](http://www.ethoswireless.com)

**FreeNetworks.org** is a volunteer cooperative association dedicated to education, collaboration, and advocacy for the creation of FreeNetworks. A FreeNetwork is any computer network that allows free local transit. FreeNetworkers have been meeting since 2000 to organize, share information, and pool resources to find the best way to build community networks. Our members include community advocates, system administrators, RF engineers, writers, lawyers, programmers, business owners, and many others who want to help build FreeNetworks in their local communities.  
[www.freenetworks.org](http://www.freenetworks.org)

**Media Access Project** (MAP) is a 30 year-old non-profit tax exempt public interest telecommunications law firm which promotes the public's First Amendment right to hear and be heard on the electronic media of today and tomorrow. MAP's work is in the courts, the FCC, and in active outreach as a coalition builder among other public interest organizations. MAP is the only Washington-based organization devoted to representing listeners' and speakers' interests in electronic media and telecommunications issues before the Federal Communications Commission, other policy-making bodies, and in the courts. [www.mediaaccess.org](http://www.mediaaccess.org)

**New America Foundation** (NAF) is a nonpartisan, non-profit public policy institute based in

Washington, DC, which, through its Wireless Future Program, studies and advocates reforms to improve our nation's management of publicly-owned assets, particularly the public airwaves.  
[www.newamerica.net](http://www.newamerica.net)

**Wireless Internet Service Providers Association** (WISPA) is dedicated to promoting and improving the WISP industry.  
[www.wispa.org](http://www.wispa.org)

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<sup>1</sup> For a summary of the literature, *see* Snider, J.H., "Reclaiming the Vast Wasteland: The Economic Case for Re-Allocating the Unused Spectrum (White Space) Between Channels 2 and 51 to Unlicensed Service," New America Foundation, Wireless Future Program Working Paper #13, February 2006, <http://www.newamerica.net/files/WorkingPaper13.UnlicensedEconCase.Snider.pdf>.

<sup>2</sup> FCC Proceeding: Notice of Proposed Rulemaking, In the Matter of Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Federal Communications Commission, adopted May 13, 2004. Public Notice, DA 06-1813, "Office of Engineering and Technology Announces Projected Schedule for Proceeding on Unlicensed Operation in the TV Broadcast Bands," released September 11, 2006. Senate Commerce Committee Legislation: H.R.5252, Title VI, "Wireless Innovation Networks," approved by Senate Commerce Committee on June 28, 2006.

<sup>3</sup> Title III of the Deficit Reduction Act of 2005.

<sup>4</sup> See the broadcast industry's comments in the FCC's LPFM proceeding (MM Docket No. 99-25) and TV white space proceeding (ET Docket No. 04-186). Although broadcasters have generally used such receiver arguments to prevent others from accessing the guard bands, they have also used them to free up the guard bands when they could capture the benefit for themselves. The most notorious example may be the AM and FM radio bands, where incumbent broadcasters argued that better digital receivers would allow them to use the first adjacent guard band without undue harm to themselves. *See* FCC MM Docket No. 99-325, In the Matter of Digital Audio Broadcast Systems and their Impact on Terrestrial Radio Broadcast Service.

<sup>5</sup> It is reasonable to assume that a consumer spending thousands of dollars on a large stand alone TV set will not be satisfied with the variety of programming available over the air and will subscribe to one of the many multichannel video program distributors (MVPD) as 86% of TV households presently do. *See* FCC 12th Annual Video Competition Report to Congress, March 3, 2006, [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-06-11A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-11A1.pdf)

<sup>6</sup> FCC 05-199 Report to Congress: Study of Digital Television Field Strength Standards and Procedures, December 9, 2005.

<sup>7</sup> FCC Notice of Proposed Rulemaking in Docket 04-186,  
[Http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-04113A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04113A1.pdf).

<sup>8</sup> "Measuring TV 'White Space' Available for Unlicensed Wireless Broadband," New America Foundation and Free Press Analysis, January 2006, <http://www.newamerica.net/index.cfm?pg=article&DocID=2713>. The share of the Channel 2-to-51 DTV band that will be unused by

February 2009, the statutory end of the DTV transition, ranges from 30-to-40 percent in congested markets like Trenton, NJ (30%) and Dallas (38%), to 70% or more in smaller markets such as Juneau, Alaska (74%) and Fargo, ND (82%). A separate channel-mapping study by Intel reached similar results.

<sup>9</sup> Implementation and Administration of a Coupon Program for Digital-to-Analog Converter Boxes NPRM, Docket Number 060512129-6129-01, Federal Register/Vol. 71, No 142, July 25, 2006, page 42070.

<sup>10</sup> [http://www.atsc.org/standards/a\\_74.pdf](http://www.atsc.org/standards/a_74.pdf)

<sup>11</sup> See <http://www.mstv.org/news.html> where video can be downloaded

<sup>12</sup> See Public Notice at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DA-06-1813A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-06-1813A1.pdf).

<sup>13</sup> University of Kansas is currently under a grant from NAF to make engineering measurements as to determine the mechanisms and power levels to create interference on various DTV tuners.

<sup>14</sup> Current channel separation practices are used due to the potential for a transmission tower close to a DTV receiver transmitting on an adjacent channel interfering with a primary channel from a distant transmission tower (near-far problem). The ability for the receiver to appropriately filter the received signals either at the input frequency or at the intermediate frequency (IF) could help alleviate this problem. Another interference mechanism is the impact of large signals on the low-noise amplifier (LNA) causing desensitization. There is a general tradeoff between the compression point of the LNA (its susceptibility to desensitization) and its power efficiency. However, incorporating an LNA with lower power efficiency in order to provide an increased resistance to desensitization should pose any adverse operation requirements for the converter boxes.

<sup>15</sup> "9/11 Commission Report," National Commission on Terrorist Attacks Upon the United States, July 2004.