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

In the Matter of	)	
	)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions	)	ET Docket No. 12-268
	)	
Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band	)	WT Docket No. 08-166
	)	
Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition	)	WT Docket No. 08-167
	)	
Amendment of Parts 15, 74 and 90 of the Commission's Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones	)	ET Docket No. 10-24

WhiteSpace Alliance

REPLY COMMENTS OF WHITESPACE ALLIANCE

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REPLY COMMENTS OF WHITESPACE ALLIANCE

WhiteSpace Alliance ("WSA") respectfully submits its reply comments to various comments filed in response to the Notice of Proposed Rulemaking of the Federal Communications Commission ("FCC" or "Commission") in the captioned proceeding.[1]

I. INTRODUCTION AND SUMMARY

WSA is a global organization that promotes the development, deployment and use of products and services in the U.S. and globally that exploit white space technologies as a means to maximize spectrum utilization for a wide variety of applications. WSA urges the Commission,

[1] Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Docket No. 12-268, Notice of Proposed Rulemaking, FCC No. 12-118 (Oct. 2, 2012)("Incentive Auction NPRM" or "NPRM").

in its implementation of the Spectrum Act[2] and through the Incentive Auction NPRM, to take specific steps to maximize the white space spectrum available in the reconfigured broadcast band for unlicensed white space use, and to authorize opportunistic use of licensed, but unused spectrum, by cognitive unlicensed devices in the television bands. WSA supports the adoption of rules for the reconfigured TV bands that foster the continued and robust deployment and use of white space devices in the TV bands and urges the Commission to continue to recognize the benefits of unlicensed network operations in TV white spaces as it adopts rules for the incentive auction and reconfigured TV bands.

In opening up the TV bands for white spaces, the Commission recognized the unique and substantial benefits that the unlicensed use of white spaces in the television bands would bring as a form of "super Wi-Fi", both in services and applications, as well as in spectral efficiency. As WSA explained in its comments and as echoed by others, the Commission's white space rules have set the stage for extremely robust white space deployments, with the availability of significant spectrum for white space use in markets around the country, particularly in rural, underserved, and unserved areas.[3] As we noted in our comments, and echoed by the PISC, in the two and a half years since the Commission's 2010 key second order on reconsideration in the white spaces proceeding, the interest in white spaces in the U.S. and abroad has exploded.[4] Even in the short period since initial comments were filed in this proceeding, there have been significant new developments in the space in addition to those cited in the initial comments.

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[2] Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, §§ 6401, *et seq.*, 125 Stat. 156 (2012).

[3] Comments of WhiteSpace Alliance at 10-12. ("WSA Comments"); Comments of Public Interest Spectrum Coalition at 18-21 ("PISC Comments"); Comments of Google Inc. and Microsoft Corporation at 46-48 ("Google/Microsoft Comments"). Unless otherwise noted, all references to comments in these reply comments are to comments filed in the instant docket.

[4] WSC Comments at 12 and Attachment A; PISC Comments at 18-21.

Numerous companies are continuing to develop radios based on award-winning technologies such as IEEE 802.22[5] (Wi-FAR™) and 4G-WhiteSpace, pilot new white space projects,[6] test white space database service implementation,[7] as well as begin commercial deployments.

There is significant agreement among commenters that the importance and potential for unlicensed white space deployments in the television band must be viewed in the context of the provision of unlicensed spectrum for Wi-Fi. As is virtually undisputed in this proceeding, Wi-Fi has resulted in extraordinary commercial investment, technical innovation, and economic benefit, as well as achieving the highest level of spectrum utilization.[8] As WSA has noted and as reflected in other comments, Wi-Fi has also become essential to the off-load of data traffic from commercial wireless networks.[9]

Thus, as echoed in the numerous comments in this proceeding as discussed below, the adoption of rules for the incentive auction, broadcast repack, and forward auction presents the Commission with significant opportunities, consistent with its statutory authority and the Spectrum Act, to maximize the availability of spectrum in the broadcast bands for white space use beyond the limited proposals in the Incentive Auction NPRM. To the same extent that its innovation, creativity and its forward thinking led to the creation of unlicensed TV band white

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[5] *See WhiteSpace Technology Makes Strides*, MicroWaves&RF (Feb. 6, 2013), *available at* http://mwrf.com/commercial/white-space-technology-makes-strides.

[6] For example, in addition to the examples of recent white space developments WSA provided with its comments (*see* WSA Comments, Attachment A), Microsoft recently announced its launch of a $75 billion "4Afrika Initiative" for African businesses, which, using white space technology, takes advantage of unused broadcast spectrum to provide high speed Internet access to remote areas in Africa. *See* Press Release, *Microsoft Introduces the 4Afrika Initiative to Help Improve the Continent's Global Competitiveness* (Feb. 4, 2013), *available at* http://www.microsoft.com/en-us/news/Press/2013/Feb13/02-04AfrikaPR.aspx.

[7] Public Notice, Office of Engineering and Technology Announces the Opening of Public Testing for Google Inc.'s TV Band Database System, DA 13-297 (Feb. 27, 2013).

[8] *See, e.g.*, Comments of Wireless Internet Service Providers Association Comments at 4-7 ("WISPA Comments"); PISC Comments at 8-17; Google/Microsoft Comments at 3-21; Comments of Computer and Communications Industry Association at 7-8 ("CCIA Comments").

[9] PISC Comments at 11-14. Google/Microsoft Comments at 13-16.

spaces use in the first place, given the significant promise of white space deployments, the fact that TV band white space databases are authorized and in place with rules for devices and deployments specifically designed and tailored for the TV bands, and that numerous companies are today investing and poised to launch new white space systems in the TV bands, the Commission must ensure the continued availability of significant swaths of contiguous spectrum in markets around the country to support the deployment of white space devices.

II. DISCUSSION

A. The Commission Should Authorize Opportunistic, "Use It Or Share It" Access to Spectrum in The Broadcast Bands, Including Both Unassigned Licensed Spectrum and Spectrum that has Been Licensed but Remains Unused.

In its comments, WSA agrees that the Commission should implement a "Use it or Share it" model for the broadcast bands following repacking and the forward auction.[10] Specifically, unused spectrum should be available in a geographic area on a localized basis for unlicensed white space use, both where a channel has been unassigned, or where a channel has been licensed, but the licensee is not using the spectrum to provide service. Accordingly, WSA, like PISC, supports the establishment of a regulatory framework permitting the use of license-exempt technologies and opportunistic use of licensed spectrum by cognitive license-exempt devices in the TV Bands.[11]

As PISC notes in its comments, under the best of circumstances, the broadcast spectrum repack, reverse and forward auctions will take a number of years to complete, with proposed build out benchmarks for new licenses for substantial service to portions of a covered population after three or four years, and with the likelihood that 100 percent of the population will not likely

[10] WSA Comments at 20, citing NPRM, ¶ 405.

[11] PISC Comments at 55-61.

be required to be served by the end of the ten-year license term.[12] As a result, as PISC notes, large portions of the 600 MHz spectrum will remain unused over wide geographic regions, with many rural areas not being built out.[13]

However, there is no reason for this spectrum to lay fallow, and the TV bands database is in place and available to govern opportunistic use of the spectrum, until the primary licensee is ready to deploy. Thus, WSA agrees with PISC that the Commission should put in place a mechanism whereby the primary licensee registers with a TV bands database prior to placing a base station in commercial service, and allow for licensees to register locations for testing or other legitimate purposes for specified times and duration prior to commercial deployment.[14] WSA agrees with PISC that 30-days in advance of the commercial or other use is a reasonable period of time to provide such notification.[15] As PISC persuasively argues, licensees lose no rights whatsoever and bear only a *de minimus* burden to simply inform the Commission and one of the TV bands database administrators prior to commencing commercial service or other use in a particular local area.[16]

B. The Commission Should Adopt the Channel 51, Down Band Plan Set Forth in Figure 12 of the NPRM to Maximize the Contiguous Spectrum Available to All Users.

There is significant agreement across a range of interests that the Commission's Channel 51, down proposed band plan depicted in Figure 12 in the NPRM, would be spectrally efficient,

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[12] *Id.* at 56.

[13] *Id.*

[14] *Id.* at 59-60. Thus, while CTIA objects that allowing unlicensed operations would interfere with a licensees ability to test and build out its network (Comments of CTIA – The Wireless Association at 40), this concern would be addressed by a the ability of a licensee to register locations in the database for testing for specified times and duration.

[15] PISC Comments at 59-60.

[16] *Id. at* 57.

and, as NAB puts it "is the simplest, most flexible and most beneficial approach for broadcasters, wireless providers and, most importantly, American consumers."[17] As NAB notes:[18]

> Creating a contiguous wireless broadband band plan with common downlink and uplink bands with no interstitial, and potentially interfering, broadcast operations has significant technical and practical advantages over the lead proposal in the Notice. . . . On the technical side, with dedicated broadcast and commercial mobile wireless bands, nearly all of the interference challenges normally present between high power broadcast and commercial mobile wireless operations can be addressed simply by providing an ample guard band to separate the services.

As WSA notes in its comments, the Channel 51, down approach also has significant benefits for unlicensed white space use. *First*, it allows for a necessarily wide duplex gap that will be available for white space use. *Second*, to the extent the Commission assigns and populates the channels as is recommended by WSA, the potential for unlicensed spectrum on either side of the duplex gaps is increased. *Third*, in contrast to the Commission's preferred plan, which would have placed TV channels on only one side of Channel 37, the Channel 51, down plan also increases the potential utility of Channel 37 for white space device use as there will be an increased likelihood of available TV channels on either side of Channel 37. *Finally*, the band plan proposed in Figure 12 is also preferable for commercial mobile since it would allow existing downlink and uplink transmitters to be re-purposed while keeping antenna efficiency at the mobile device high, since the downlink and uplink would be proximately located close to each other, separated only by a duplex gap.[19]

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[17] NAB Comments at 45. *See also* Letter from AT&T, Inc., Intel Corporation, National Association of Broadcasters, Qualcomm, T-Mobile, Verizon Wireless, filed January 24, 2013 in the instant proceeding.

[18] NAB Comments at 45.

[19] *See* WSA Comments at 24-25.

C. The Commission Should Allow the Unlicensed Use of the Guard Bands and Duplex Gap, and Set the Guard Bands at 10 – 12 MHz and the Duplex Gap at 18 - 24 MHz.

There appears to be broad agreement, as urged by WSA, that under the Channel 51, down band plan the Commission should allow unlicensed white space deployments in both the single guard band between broadcast TV channels and the downlink block, and the duplex gap.[20] WSA continues to believe that 10 to 12 MHz is an appropriate width for the guard band, and 18 to 24 MHz is an appropriate width for the duplex gap.

Many commenters propose comparable sizes for the guard band and duplex gap. For example, Microsoft and Google in their joint comments indicate that a duplex gap of 28 MHz is "technically reasonable."[21] NAB also urges a duplex gap of "ample size" for unlicensed devices and wireless microphones.[22] Similarly, the National Cable & Telecommunications Association, argues that adoption of "an adequately sized duplex gap would provide universal, contiguous spectrum for unlicensed use," noting that 20 MHz is the minimum bandwidth necessary to enable sufficient throughput for data services, including offload of traffic from licensed providers.[23] Comcast Corp. together with NBCUniversal Media likewise argue for 20 MHz of contiguous spectrum for unlicensed use.[24] Finally, Verizon notes that guard bands will likely need to be greater than the 6 MHz proposed in the NPRM, where mobile operations are adjacent

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[20] *See, e.g.*, Google/Microsoft Comments at 21-34; PISC Comments at 21-26; CCIA Comments at 2-5; Comments of National Cable and Telecommunications Association at 11-12 ("NCTA Comments").

[21] Google/Microsoft Comments at 37.

[22] NAB Comments at 45-46.

[23] NCTA Comments at 7, n. 20, 17-18.

[24] Comments of Comcast Corp. and NBCUniversal Media, LLC at 40-46.

to high powered broadcast operations, and assumes a minimum 10 MHz guard band between the mobile downlink to protect the mobile downlink from adjacent broadcast operations.[25]

WSA continues to believe, based on its review of the comments, that the guard band and duplex gap needs to be of sufficient width, in this case its recommended widths of, respectively, 10-12 MHz wide and 18-24 MHz, so as to allow filters that can provide sufficient isolation between the downlink and the uplink in these bands. This will also help to avoid interference from full power TV broadcasts into the proposed downlink and uplink spectrum, and vice versa, and provide for efficient filtering between downlink and uplink in these low frequency bands.

D. Rather than Auctioning New Wireless Licenses for a Specific Channel Assignment, Specific Channels Should be Assigned to Winning Bidders at the Time of Deployment, and the Band Should be Populated Contiguously, to First Occupy the Available Slots Furthest from the Duplex Gap Specified in The Channel 51, Down Band Plan.

In its auction design, the Commission proposed to make available multiple blocks of spectrum available in a market, and collect bids on one or more generic categories of licenses, rather than for a specific license.[26] This proposal recognizes, as do a number of commenters, that channels within each of the uplink and downlink blocks are essentially "fungible."[27] In that case, as WSA notes in its comments, rather than auctioning specific frequencies, the Commission can assign specific frequencies and authorize deployment of those blocks contiguously. This would allow available blocks to be organized like parking spaces in a parking lot and packed together in an orderly fashion at the time of the deployment, rather than allowing assigned channels to be

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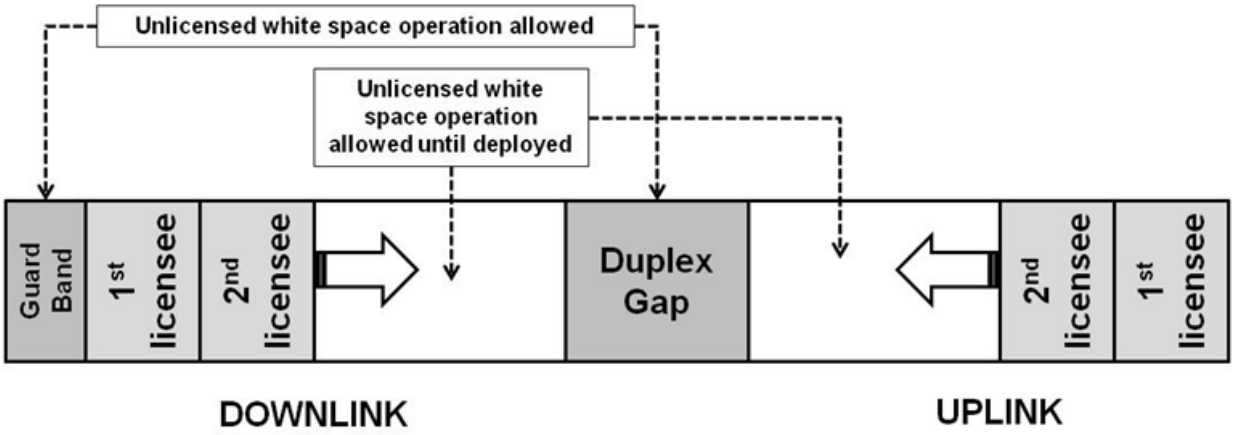
[25] Comments of Verizon and Verizon Wireless at 19-20.

[26] NPRM, ¶ 56. Under this proposal, the FCC would announce prices for generic licenses in each category (such as paired or unpaired licenses) in each geographic area, and bidders would submit quantity bids for the number of licenses they seek. *Id.*, ¶ 60.

[27] *See, e.g.,* Comments of T-Mobile at 14. Comments of AT&T at 41.

scattered and fragmented.[28] Considering the Channel 51, down band plan, under this approach, the licensees would occupy the spectrum at deployment in the following sequence for each geographically identified area:[29]



In addition, assuming that white space operations are permitted in the duplex gap and guard band, WSA recommends that the center of the duplex gap and the guard band frequencies could be harmonized across the U.S. Together with the "use it or share it" regime, this will serve to increase spectrum efficiencies and maximize the potential for the creation of vacant white space spectrum that will be available for white space device use, even in the licensed bands.[30]

E. The Commission Should Make Channel 37 Available for Unlicensed White Space Device Use, While Continuing to Protect Radio Astronomy Service and Wireless Medical Telemetry System Users through Registration of Narrowly Drawn Protection Areas in the White Space Database.

In its comments, WSA urged that the Commission should allow for opportunistic use of Channel 37 by unlicensed white space devices in areas where the spectrum is not being used.[31]

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[28] WSA Comments at 26.

[29] *Id.*

[30] *Id.*

[31] *Id.* at 27-28.

Specifically, Channel 37 incumbent radio astronomy service (RAS) and wireless medical telemetry system (WMTS) users should register their operations with a TV bands database, which would allow white space devices to operate on Channel 37 in areas throughout the country subject to TV band database-enforced protection areas in geographic regions where RAS and WMTS deployments would be adversely affected by the operation of white space devices. This position is supported by several commenters, including WISPA and PISC, which support unlicensed use of Channel 37, subject to protection of incumbent operations using the TV bands database.[32]

As WSA notes in its comments, WMTS devices, in particular, are already registered in a database operated by the American Society of Healthcare Engineering (ASHE) of the American Hospital Association, and disagree with WMTS interests that importing WMTS registrations into the TV bands database would provide any significant burden whatsoever on WMTS operations. For example, GE Healthcare argues that use of the TV bands database would require all WMTS devices to "be known, registered, and/or capable of being identified," a prospect it describes as a "daunting."[33] To the extent there are differences between the actual location and the current reported location of a WMTS deployment,[34] the Commission can provide WMTS licensees with a transition period to update their license information in connection with registrations to the TV bands databases. In addition, there is nothing about such an approach that would prevent the

[32] WISPA Comments at 14-17; PISC Comments at 27-28.

[33] Comments of GE Healthcare at 32-33.

[34] *See* Initial Comments of WMTS Coalition at 22 (noting that the registered geographic coordinates are not necessarily the locations of the actual deployments, but may be the coordinates of the mailing address of the hospital or estimates prepared by non-engineers, and, for a large hospital, may be up to a quarter of a mile from the "protection location" in the WMTS registration).

expansion of systems or deployment of new systems as urged by WMTS Coalition,[35] as new devices can, of course, be freely added to the database with new protection zones created.

Similarly, to the extent the complaint of WMTS users is over concerns with the accuracy of their current license information, the answer is not to preclude efficient, unlicensed use of Channel 37 where there is no technical reason to preclude such use. Rather, incumbent licensees should be given an opportunity to update their location information over a reasonable period of time, register their uses, and then unlicensed, non-interfering uses should be allowed to proceed. Finally, while the Commission may have made the safe choice when TV white spaces were first authorized to protect WMTS and RAS operations given little experience with TV band database performance, as PISC notes, database administrators have now been selected and certified, and the ability of commercial databases to protect incumbents' operations in identifiable geographic exclusion zones is no longer in question.[36]

F. The Commission Should Take a Number of Actions to Promote More Efficient and Effective Operations of Wireless Microphones in the Broadcast Bands.

WSA agrees with various commenters that urge the Commission to take a number of steps to allow for more efficient sharing between wireless microphone use and TV band devices. *First*, wireless microphones should first be required to occupy channels that are unavailable for TV band use.[37] *Second*, as WSA argued in its comments, and as PISC, WISPA, and Spectrum Bridge agree, wireless microphones should be required to use spectrum that is co-channel with

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[35] *Id.* at 22.

[36] PISC Comments at 28-29. As PISC notes "it should be straightforward to define and enforce exclusion zones using the TV Bands Database." *Id.* *See also* Comments of Spectrum Bridge, Inc. at 9 ("Spectrum Bridge Comments")(agreeing that the existing TV White Space database "can handle the management of these facilities").

[37] WSA Comments at 36; PISC Comments at 39-40; WISPA Comments at 18; Spectrum Bridge Comments at 9.

TV spectrum, and the Commission should reduce the distance required for co-channel operation.[38]

For example, WSA understands, that as a practical matter, wireless microphones often operate, in coordination with broadcasters, co-channel to distant broadcast channels that may not be open to TV white space devices.[39] Moreover, in many interior venues, wireless microphones can operate free from interference from broadcast stations that are well inside the Commission's co-channel protection criteria.[40] Even today, as the Broadway League recognizes, "nowhere are there fewer available channels than in the heart of the Broadway Theatre District and *through skillful engineering and coordination*, Broadway theatres have extracted use from every available slice of spectrum without causing interference."[41]

Indeed wireless microphone manufacturer Sennheiser agrees that rather than the fixed separation criteria, it would be preferable to allow wireless microphones "to operate at locations where a co-channel TV signal is below a specified threshold." Essentially taking the same view as PISC, Sennheiser found that determining signal level of the TV station at the microphone location, actual signal attenuation can be taken into account, for example from the presence of interior and exterior walls.[42] These would in effect reduce the distance required to protect co-channel TV stations. Combined with a rule that would require wireless microphones to occupy non-TV band channels first, this could free up additional channels for TV band device use.

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[38] PISC Comments at 38.

[39] WSA Comments at 34-35. *See also* PISC Comments at 34-37; Spectrum Bridge Comments at 9.

[40] PISC Comments at 34-37.

[41] Comments of the Broadway League, Inc. at 12 (emphasis added)..

[42] Comments of Sennheiser Electronic Corp. at 11.

Third, as WSA urged in its comments, and supported by other commenters, the two wireless reserve channels should remain available for wireless microphone use, but only on a non-exclusive basis.[43] Rather than the current regime, this would not preclude shared use by TV bands devices when wireless microphones are not occupying the spectrum.

Finally, as WSA urged in its comments, unlicensed, Part 15 wireless microphones operating in the TV bands should be treated like any other unlicensed white space device that uses, but is not protected through the white space database, and be required to operate as a TV band device in accordance with the TV white space rules.[44]

G. Fixed White Space Operations Should be Permitted with a Separation of Only 3 MHz From an Active TV Channel, Rather than the Current Prohibition of Operations on an adjacent Channel.

As a final matter, WSA wishes to emphasize, as noted in its comments, that the Commission should allow fixed white space operations with a separation of only 3 MHz from an active TV channel, rather than the current prohibition of fixed TV band device operations on an adjacent channel.[45] This provides a 6 MHz guard band around a TV station, and effectively requires three contiguous channels ("triplets") for fixed white space operations, with a 6 MHz channel for operation, and a 6 MHz guard band on either side for protection. This one change would have two significant effects greatly increasing the availability of channels for unlicensed white space use. *First*, it would enable the use of double channels for fixed white space use, rather than the need for triplets as is now required. *Second*, it would double the capacity of triplets. Where today triplets, 18 MHz of spectrum, can only be used for a single 6 MHz fixed

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[43] *See* WISPA Comments at 20; Spectrum Bridge Comments at 9; PISC Comments at 41; Comments of Neul Limited at 6-7.

[44] WSA Comments at 35; *see also* Spectrum Bridge Comments at 8.

[45] *See* WSA Comments at 32-33. WISPA likewise asks the Commission "to relax the restrictions that prevent TV bands devices from operating on channels adjacent to protected stations." WISPA Comments at 33.

TV band device, changing the separation to 3 MHz would allow three channels to be used for two, 6 MHz fixed deployments, with 3 MHz separation from existing TV stations on either side.

III. CONCLUSION

WHEREFORE, as set forth more fully in its comments and these reply comments, and as echoed by numerous commenters in this proceeding, in implementing the Spectrum Act and adopting rules for the reverse auction, broadcast spectrum repack, and forward auction, the Commission should recognize the substantial benefits that flow from unlicensed white space deployments in the broadcast bands. The Commission should adopt rules that maximize the continued availability of significant contiguous blocks of spectrum for unlicensed operation in the TV bands, and authorize the opportunistic use by white space technologies of both unlicensed channels, and licensed, but *unused* channels. In this manner, the Commission will foster the demonstrated benefits of unlicensed white space spectrum operations, including as engines of technological innovation, efficient spectrum utilization, and competition in broadband markets.

Respectfully submitted,
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