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August 3, 2005

By Electronic Submission

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

Re: WT Docket No. 05-157
FCC 05-80
Written Ex Parte Presentation

Dear Ms. Dortch:

On August 3, 2005, Access Spectrum, L.L.C., Pegasus Guard Band, L.L.C., Columbia Capital Equity Partners III, L.P., and PTPMS II Communications, L.L.C. submitted to the Commission for its consideration the attached White Paper, "Implementing the Vision for 700 MHz: Rebanding the Upper 700 MHz A and B Blocks for Next-Generation Wireless Broadband," and the attached transmittal letter.

Though not a required filing, a copy of this letter is being provided to you for inclusion in the public record of the above-referenced proceeding in the belief that many of the participants in that proceeding will find it of interest.

Sincerely,

Kenneth R. Boley
Counsel to Access Spectrum, L.L.C.

cc: Chairman Kevin J. Martin
Commissioner Kathleen Abernathy
Commissioner Michael Copps
Commissioner Jonathan Adelstein
John Branscome
Fred Campbell
Lloyd Coward
Scott Delacourt
Samuel Feder
Bruce Franca
John Giusti
Daniel Gonzalez
Julius Knapp
William Kunze
Roger Noel
Barry Ohlson
Catherine Seidel
David Siehl
Alan Stillwell
Joel Taubenblatt
Peter Tenhula
Michael Wilhelm

August 3, 2005

The Honorable Kevin J. Martin
Chairman
Federal Communications Commission
Washington, DC 20554

Dear Chairman Martin:

Access Spectrum, L.L.C., Pegasus Guard Band, L.L.C., Columbia Capital Equity Partners III, L.P., and PTPMS II Communications, L.L.C. hereby submit the attached White Paper, "Implementing the Vision for 700 MHz: Rebanding the Upper 700 MHz A and B Blocks for Next-Generation Wireless Broadband." The White Paper outlines a series of pertinent topics for a Notice of Proposed Rulemaking that the Federal Communications Commission has voted to commence.

Respectfully submitted,

Pegasus Guard Band, L.L.C.

/s/ Marshall Pagon
Marshall Pagon
Chief Executive Officer

Access Spectrum, L.L.C.

/s/ Michael Gottdenker
Michael Gottdenker
Chief Executive Officer

IMPLEMENTING THE VISION FOR 700 MHz:

REBANDING THE UPPER 700 MHz A AND B BLOCKS FOR NEXT-GENERATION WIRELESS BROADBAND

A White Paper Submitted by
Upper 700 MHz A and B Block Licensees

ACCESS SPECTRUM, L.L.C.

COLUMBIA CAPITAL EQUITY PARTNERS III, L.P.

PEGASUS GUARD BAND, L.L.C.

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With support from

ENTERPRISE WIRELESS ALLIANCE

Dated: August 3, 2005

TABLE OF CONTENTS

I.	**Executive Summary**	1
II.	**The Vision for 700 MHz**	3
	A. The A and B Blocks – The First Opportunity for Broadband at 700 MHz	4
	B. Selecting a New Band Plan	7
	1. Option One: 1.5 MHz Paired to Public Safety; 1.5 MHz Paired Commercial	7
	2. Option Two: Adjacent Commercial 1.5 MHz Pairs	9
	3. Option Three: 1 MHz Paired to Public Safety; 2 MHz Paired Commercial	11
	C. Deployment Plausibility in the Rebanded Upper 700 MHz	12
III.	**Broadband Applications for Public Safety**	15
	A. Enabling the Option of Broadband Within Public Safety Blocks	17
	B. Enabling a Mixed-Use Option	18
IV.	**Licensing and Technical Issues**	19
	A. Licensing Issues	19
	1. Timing	19
	2. Pricing and Compensation Issues	21
	B. Technical Issues	22
	1. Causes of Interference and Measures to Address Them	22
	2. Narrowband Rules in a Broadband World	26
V.	**Conclusion**	29
VI.	**Appendix**	App.1
	A. Background	App.1
	B. The Importance of Broadband	App.2
	C. Why 700 MHz Is Ideally Suited for Broadband	App.3

Implementing the Vision for 700 MHz:
Rebanding the Upper 700 MHz A and B Blocks for
Next-Generation Wireless Broadband

I. Executive Summary

There is broad, bipartisan consensus that expansion of broadband access is a critical public policy imperative. In fact, earlier this month Chairman Martin wrote that:

> *Creating a policy environment that speeds the deployment of broadband throughout the U.S. is my highest priority as the new chairman of the FCC.*[1]

We share Chairman Martin's sense of urgency.

We are licensees in the Upper 700 MHz[2] who believe that recent advances in technology enable two compelling public policy imperatives to be harmoniously achieved in the Upper 700 MHz:

- Deployment of wireless broadband networks that will provide commercial and public safety users access to next generation services from both fixed and mobile locations; and
- Protection of public safety operations in adjacent spectrum from undue interference.

Congress is currently considering legislation that will mandate a hard date by which incumbent television broadcast licensees must vacate the 700 MHz band.

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[1] *Wall Street Journal*, "United States of Broadband," Kevin J. Martin (July 7, 2005) at A12.

[2] This white paper is submitted by the following Upper 700 MHz A and B Block licensees: Access Spectrum, L.L.C.; Pegasus Guard Band, L.L.C.; Columbia Capital Equity Partners III, L.P.; and PTPMS II Communications, L.L.C., and is also supported by Enterprise Wireless Alliance (formerly ITA). The Upper 700 MHz, which includes UHF TV channels 60 through 69, comprises four commercial blocks (A, B, C and D) and a public safety block. To date, only the A and B Blocks have been licensed.

However, much of the Upper 700 MHz spectrum is relatively unencumbered by incumbent television broadcasters. Indeed, the Upper 700 MHz A and B Blocks *today* could be used to provide broadband service to approximately 60 percent of the population of the United States, without interfering with *any* existing television stations. With adjustments to the current Upper 700 MHz band plan and its associated technical rules as outlined in the body of this white paper, this spectrum can be freed for deployment of commercial and public safety wireless broadband networks *immediately* in some markets and in remaining markets in 2009 when it is likely that Congress will require incumbent television broadcasters to cease operation in the remainder of the 700 MHz band.

This white paper outlines a series of pertinent topics for a Notice of Proposed Rulemaking ("NPRM") that the Federal Communications Commission in 2004 twice voted unanimously to commence.[3] We believe that a primary goal of the NPRM should be to determine how the Upper 700 MHz A and B Blocks should be reconfigured to facilitate wireless broadband networks that will provide next generation services for commercial and public safety users from both fixed and mobile locations.

As discussed in more detail below, we believe that the return of Nextel's B Block spectrum provides the Commission an immediate opportunity to expedite development of next-generation wireless broadband networks in the Upper 700 MHz band. We believe that the Commission should act promptly to capitalize on this opportunity by re-banding

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[3] *See Improving Public Safety Communications in the 800 MHz Band; Consolidating the 800 and 900 MHz Industrial/Land Transportation and Business Pool Channels*, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order, 19 FCC Rcd 14969, ¶¶ 208-209 (2004) ("*800 MHz R&O*"); *Improving Public Safety Communications in the 800 MHz Band; Consolidating the 800 and 900 MHz Industrial/Land Transportation and Business Pool Channels*, Report and Order, Supplemental Order and Order on Reconsideration, 19 FCC Rcd 25120, ¶ 8 n.19 (2004) ("*800 MHz Recon Order*").

the Upper 700 MHz spectrum to channel sizes useful for next-generation broadband technologies and by implementing technical rules to permit deployment of proven, standard wireless broadband architectures. The proposed re-banding will allow the achievement of the two public policy imperatives noted in the opening section of this white paper in a manner that ensures efficient and innovative use of a valuable, and scarce, public resource.

This white paper describes three alternatives to alter the Upper 700 MHz A and B Block band plan and advocates designing technical rules for the A and B Blocks to facilitate next-generation wireless broadband deployment. Each rebanding option has been designed to meet the following three goals:

- Continue to protect public safety from interference;
- Enable broadband deployment for public safety, commercial, and mixed-use operations; and
- Improve the spectrum efficiency of the Upper 700 MHz band.

II. The Vision for 700 MHz

Marketplace and technological developments since the adoption of the Upper 700 MHz A and B Block orders[4] suggest that the highest and best use of this spectrum is for next-generation wireless broadband services.[5] In the five years since these orders were

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[4] *See Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, 15 FCC Rcd 476 (2000) ("*Upper 700 MHz First R&O*") (adopting band plan that includes 6 megahertz paired of spectrum divided into A and B Blocks); *see also Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, 15 FCC Rcd 5299 (2000) ("*Upper 700 MHz Second R&O*") (adopting service rules for the A and B Blocks). *See* attached Appendix, Sec. A for background on the Upper 700 MHz.

[5] *See* attached Appendix, Sec. B for a discussion of the importance of broadband.

adopted, narrowband technologies have been fully developed by commercial providers in other bands. During the same period, companies have developed a number of next-generation wireless broadband technologies, particularly for mobile applications, that could be more widely offered to the public today were it not for the lack of access to suitable spectrum. The 700 MHz band is ideally suited to meet the pent-up demand for next-generation wireless broadband services for consumers, businesses, and public safety, particularly in lower density suburban and rural localities.[6] However, the current configuration and rules for the Upper 700 MHz A and B Blocks were tailored to a narrowband vision and must be amended to meet the Commission's broadband vision for 700 MHz.

A. The A and B Blocks—The First Opportunity for Broadband at 700 MHz

Although the Upper 700 MHz A and B Blocks theoretically are available for a range of commercial uses today, in practice those uses are restricted by the band plan and service rules the Commission adopted five years ago. The current Upper 700 MHz band plan maximizes neither public utility nor economic value as it effectively constrains the A and B Blocks to narrowband uses. This constraint is increasingly burdensome and ironic in an environment characterized by growing demand for broadband services that lack licensed spectrum suitable for deployment. To maximize the utility of the Upper 700 MHz band and realize the Commission's broadband vision, the band plan must be reconfigured to facilitate the provision of broadband services.

Currently, the A Block is 1 megahertz paired, and the B Block is 2 megahertz paired:

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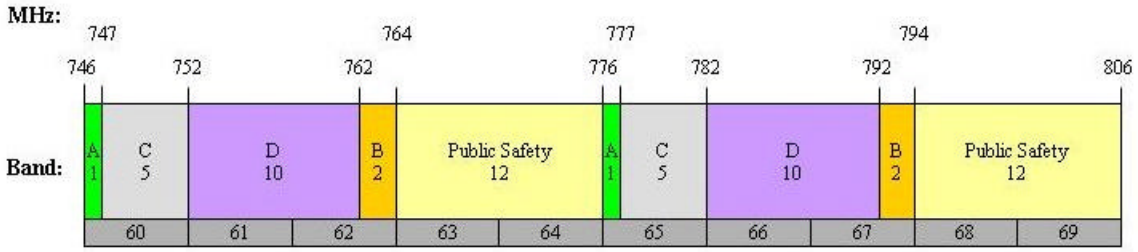
[6] *See* attached Appendix, Sec. C for a discussion of why the 700 MHz band is ideally suited for broadband.

Existing Band Plan



Yellow = Public Safety: 12 MHz pair

Green = A Block: 1 MHz pair

Orange = B Block: 2 MHz pair

Gray = C Block: 5 MHz pair

Purple = D Block: 10 MHz pair

Although the A and B Blocks collectively are 6 megahertz today, those blocks are configured in a manner that renders one third to one half of that spectrum unusable for broadband. As a rule of thumb, next-generation technologies require at least 1.25 MHz of contiguous spectrum to provide broadband service.[7] Another few hundred kHz will also be necessary as a buffer for interference protection to and from adjacent channel broadband operations,[8] unless adjacent operations use a compatible broadband technology. These constraints apply to various existing and emerging next-generation

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[7] For instance, in the Air-to-Ground ("ATG") proceeding, at least four prospective providers of ATG stated that 1.25 megahertz is necessary for broadband service. *See Amendment of Part 22 of the Commission's Rules to Benefit the Consumers of Air-Ground Telecommunications Services*, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd 4403, ¶ 31 (2005); E-mail from Michele C. Farquhar to Richard Arsenault, FCC, attached to Letter from Michele C. Farquhar, Counsel to AirCell, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 03-103 (Oct. 15, 2004); Verizon Airfone's Comments on Notice of Proposed Rulemaking, WT Docket No. 03-103, at 8 (Sep. 23, 2003); Letter from Henry Goldberg, Counsel to Flarion Technologies, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 03-103, at 1 (Oct. 4, 2004); Letter from Dean R. Brenner, QUALCOMM Incorporated, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 03-103, Attachment at 1 (Sept. 3, 2004).

[8] *See* Sections II.C and IV.B, below, for discussions of interference issues. *See also*, Letter from Henry Goldberg, Counsel to Flarion Technologies, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 03-103 (Oct. 4, 2004).

wireless broadband technologies, including: current CDMA operations (*e.g.*, CDMA2000 1xRTT); the 3G CDMA platform (*e.g.*, 1xEV-DO or WCDMA); and OFDM-based services (*e.g.*, WiMAX or FLASH-OFDM, which is currently being used in a public safety trial in Washington, DC). Since the Upper 700 MHz A Block is only 1 megahertz paired, it cannot accommodate any 1.25 megahertz broadband channels. The B Block permits a single broadband channel, but likely strands several hundred kHz paired that cannot be used for broadband. As a result, less than half of the 6 MHz in the A and B Blocks as currently configured can be used for next-generation wireless broadband.

Rebanding the A and B Blocks to better enable broadband will permit licensees to establish an early proving ground for broadband services at 700 MHz in advance of later auctions in the band (*i.e.*, the Upper 700 MHz C and D Block auctions) and prior to the clearing of the Lower 700 MHz band. By enabling all of the spectrum that had been included in Nextel's B Block holdings to be used for broadband applications, rebanding would also increase the value of that spectrum, thus increasing the revenue realized by the U.S. Treasury. Further, by increasing the amount of spectrum available for broadband, the Commission will enable manufacturers and service providers to test a variety of broadband products and make any needed changes before incurring the costs of developing services and equipment for the remaining commercial spectrum. Early experience with the A and B Blocks will better enable manufacturers to focus their efforts; consumers and the public safety community will be the beneficiaries of the improved products and services that result.

B. Selecting a New Band Plan

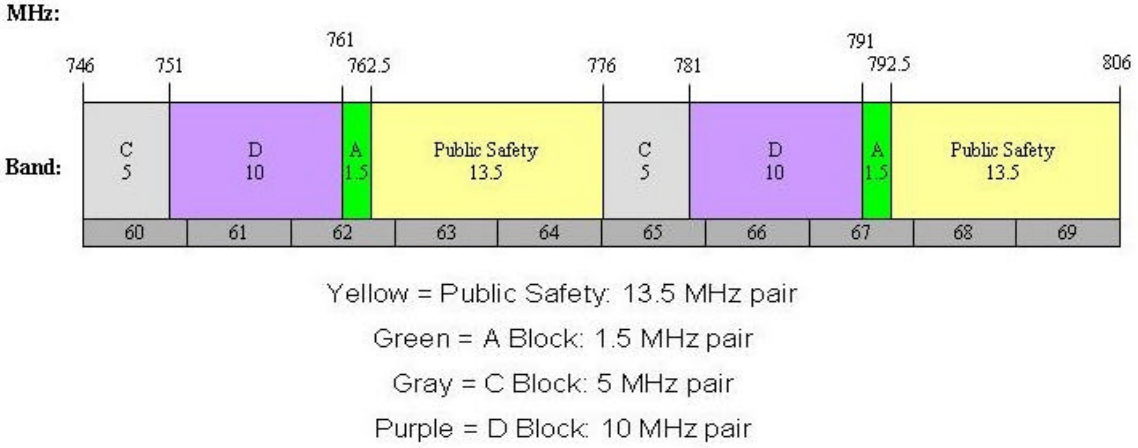
Implementing a rebanding of the A and B Blocks will require the Commission to adopt a new band plan, develop rules for pricing and re-licensing the spectrum included in the returned Nextel Upper 700 MHz B Block licenses, and develop technical rules that enable—rather than thwart—the use of the latest broadband technologies while still providing public safety operations with suitable protection from interference.

Below are three alternative band plans for the Upper 700 MHz band designed to foster broadband deployment. Each option would divide the valuable and limited spectrum resources in the band more efficiently than the current band plan. While each approach has different advantages and disadvantages, all of the plans would benefit the public and better enable broadband applications than does the current band plan.

1. Option One: 1.5 MHz Paired to Public Safety; 1.5 MHz Paired Commercial

This option would make efficient use of the 6 MHz in the current A and B Blocks by creating a 1.5 MHz paired A Block adjacent to a new 1.5 MHz segment added to the lower end of each Public Safety Block (currently 12 MHz paired, 764-776 MHz and 794-806 MHz), thus bringing the Public Safety Blocks to 13.5 MHz paired.

Option One



Under this approach, the A Block would have the minimum bandwidth necessary for next-generation broadband. The additional 1.5 MHz appended to each Public Safety Block will provide additional spectrum resources necessary to help public safety deploy broadband. Further, placing the 1.5 MHz paired A Block adjacent to the additional spectrum included in the Public Safety Block positions 3 MHz of spectrum together. This creates an additional opportunity, which cannot be achieved through the existing public safety band plan, for public safety and commercial providers to cooperate to provide a mixed-use nationwide broadband network that would help meet the broadband needs of public safety. "The case for relying on commercial systems … is that they enable public safety agencies to benefit from the considerable economies of scale and enhanced functionalities that commercial providers can offer."[9]

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[9] Dale Hatfield and Phil Weiser, *Taking a Fresh Look at Public Safety's Spectrum Needs: Toward a Next Generation Strategy for Public Safety Communications*, at 12 ("*Taking a Fresh Look*"), attached to letter from David S. Konczal, Mobile Satellite Ventures LP, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 05-157 (June 17, 2005).

In this scenario, the new spectrum in the Public Safety Blocks could be used to carry public safety broadband service. Thus, positioning a broadband A Block at the bottom edge of each Public Safety Block would place commercial broadband adjacent to public safety broadband, allowing a buffer of 250 kHz for protection against interference between the operations in the A Blocks and the operations in the Public Safety Blocks. In fact, if both the A Block and public safety broadband operations used compatible broadband technologies, no buffer would be necessary to protect against interference caused by out-of-band emissions ("OOBE"). Because of its location next to new public safety spectrum, the A Block could be used for either commercial or mixed-use broadband applications. And even if the new public safety spectrum was not used for broadband, public safety could nevertheless use it as desired to protect its narrowband and wideband services.

This option does not contemplate changing the size of the C or D Blocks but does require them to shift 1 MHz.[10] See Sections II.C and IV.B, below, for discussions of potential interference issues, including any that may arise at 776 MHz, where the C Block would be adjacent to the Public Safety Block.

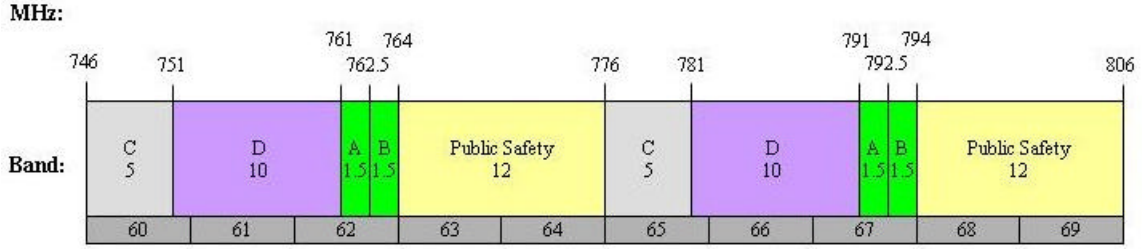
2. Option Two: Adjacent Commercial 1.5 MHz Pairs

In this option, the 6 MHz in the current A and B Blocks would be re-arranged to form a 1.5 MHz A Block pair adjacent to a 1.5 MHz B Block pair. Each pair would be large enough for broadband applications, but this option would offer the additional flexibility of being able to accommodate two broadband neighbors (one licensee for the A Blocks, one for the B Blocks), or a single licensee (holding both the A and the B

[10] For all three rebanding options, this shift should not be problematic because the C and D Blocks are not currently licensed.

Blocks). As in Option One, the A and B Block channels adjacent to the Public Safety Blocks could be either commercial or mixed-use.

Option Two



Yellow = Public Safety: 12 MHz pair

Green = A Block: 1.5 MHz pair

Orange = B Block: 1.5 MHz pair

Gray = C Block: 5 MHz pair

Purple = D Block: 10 MHz pair

Because both the A Block channel and the adjacent B Block channel would be broadband, the buffer necessary for OOBE interference protection between them could be 250 kHz; if the two channels used compatible broadband technologies, the buffer could be eliminated. The same would be true if public safety used compatible broadband technology at the lower end of its paired blocks. Even if that public safety spectrum remained narrowband, the combined 3 MHz paired A and B Blocks provide more scope and flexibility to the commercial license holder(s) to make sure there is no undue interference with public safety operations. In addition, if desired, public safety could combine 2 MHz at the bottom of its spectrum blocks with the 3 MHz in the A and B Blocks to create 5 MHz paired segments. Using common infrastructure, part of the 5 MHz paired segments could be employed for mixed use and the rest could be dedicated to public safety mission critical operations.

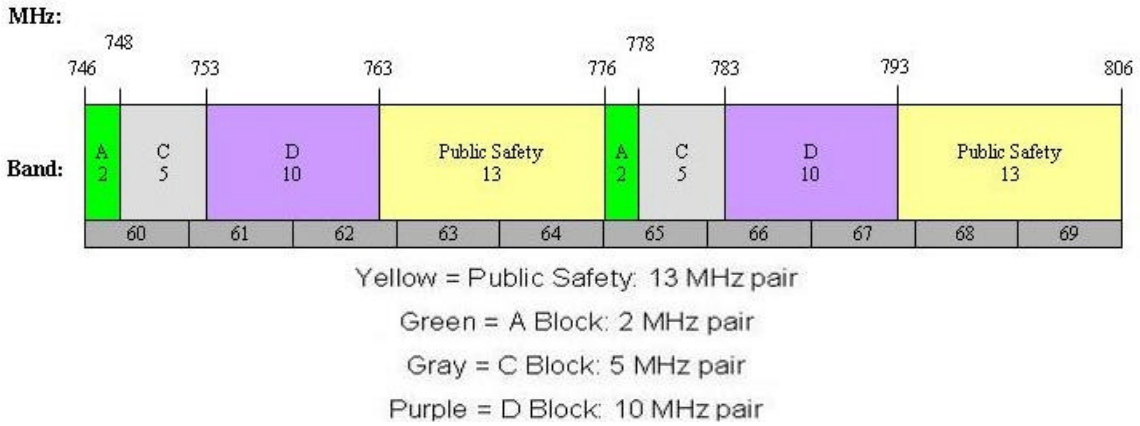
The Public Safety Blocks would be comprised of exactly the same spectrum as they are today, but the C and D Blocks, while retaining their size, would shift 1 MHz. As

with Option One, there is the potential for interference where the C Block is adjacent to the Public Safety Block at 776 MHz. See Sections II.C and IV.B, below, for discussions of potential interference issues.

3. Option Three: 1 MHz Paired to Public Safety; 2 MHz Paired Commercial

Like Option One, this third option would increase the spectrum available to public safety by adding to the lower end of the Public Safety Block pair, but rather than moving the A Block to the bottom edge of the Public Safety Block, it would leave the A Block in its current location, increasing its size by 1 MHz paired. The resulting A Block would be 2 MHz paired (rather than 1 MHz paired today or 1.5 MHz paired as in Options One and Two), and Public Safety would become 13 MHz paired (rather than 12 MHz currently and in Option Two or 13.5 MHz paired as in Option One). The C and D Blocks would shift 1 MHz.

Option Three



Providing for 2 MHz paired in the A Block increases the flexibility for A Block licensees to deploy broadband operations, enabling the A Block to include not only 1.25 MHz channels but also a 375 kHz buffer on each side of the broadband channel. This buffer could be increased on one side of the broadband channel and decreased on the

other (within the total of 750 kHz), as necessary, depending on the extent to which technologies near the A Block edges conflict with the technology deployed within the A Block broadband channel.

Any concerns about interference at the upper edge of the D Block may be mitigated by public safety's control of an additional 1 MHz of spectrum at its lower edge, which could be used for a non-conflicting technology or as a buffer, as public safety sees fit. In addition, as in Option One, there may be interference concerns at 776 MHz where the A Block and Public Safety Block meet; see Sections II.C and IV.B, below, for discussions of this and other interference issues.

C. Deployment Plausibility in the Rebanded Upper 700 MHz

In evaluating various band plan options, we considered whether each option was likely to permit a commercially viable wireless broadband service without causing undue interference to public safety operations. While it is possible, as discussed below, that public safety may choose to reconfigure its spectrum to include broadband operations, particularly if additional spectrum is allocated for public safety use, for purposes of this plausibility assessment, we assumed that narrowband public safety operations would be adjacent to commercial broadband operations. We also assumed that the broadband and narrowband technologies deployed were those that exist today.[11] This assessment is based on information we have received from technology providers, and it considers the implications of the proposed rebanding for three main types of interference: out-of-band emissions ("OOBE"), receiver overload and intermodulation. The assessment suggests

[11] Throughout this discussion, the use of the term "broadband systems" refers to the set of technologies used today for broadband applications, and the use of the term "narrowband systems" similarly refers to the set of technologies used today for narrowband applications, including bandwidths of 6.25 kHz, 12.5 kHz and 25 kHz.

that proper equipment design and correct system deployment could be used to economically resolve each of these interference issues.[12]

OOBE. Interference from OOBE can be reduced and effectively eliminated by using transmitting equipment that emits little or no energy outside of the equipment's desired bandwidth. According to the technology providers surveyed, a number of currently available technologies for commercial broadband services control OOBE sufficiently to meet existing standards for some or all of the options above. Based on our discussions with technology providers and our own engineering analysis, an OFDM (Orthogonal Frequency Division Multiplex) system,[13] a UMTS-TD-CDMA (Universal Mobile Telecommunication Systems—Time Division—Code Division Multiple Access) system, or a CDMA 2000 system could control OOBE sufficiently to protect public safety from undue interference. If the commercial block is adjacent to broadband public safety applications, the OOBE rules can be designed to permit robust commercial applications while still protecting public safety. Even if the current OOBE limits remain in place for protecting narrowband systems close to the edge of the commercial band,[14] commercial broadband applications would still be possible, but with some modification of the technology and/or with a penalty in terms of realizable capacity or performance.

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[12] *See* Section IV.B, below, for a discussion of interference issues that contemplates the possibility of expanded public safety operations (including broadband) and suggests issues that the FCC should explore in the context of the NPRM.

[13] For example, the District of Columbia Office of the Chief Technology Officer ("OCTO") has deployed a broadband public safety system in Washington using Flarion's Flash-OFDM technology.

[14] *See, e.g.*, the restrictions established to protect commercial systems from cellular OOBE interference or the restrictions established to protect public safety narrowband operations from emissions by systems in the C and D Blocks, 47 C.F.R. § 27.53(c)(3) and (4).

Front End Overload. Public safety narrowband receivers are designed to be highly sensitive to transmissions over the full width of the designated public safety band. Because current public safety narrowband receivers only gradually reduce their sensitivity from the high in-band level, they retain some sensitivity to transmissions outside of the public safety band. As a result, current public safety receivers pick up in their "front ends" energy from transmissions in spectrum adjacent to the public safety band, and that undesired energy—if strong enough—can cause interference to the public safety receiver. Thus, a correctly operating commercial broadband system adjacent to public safety operations could cause the public safety receiver to become desensitized if the receiver were very near the broadband transmitter, typically less than 100 yards. Interference from front end overload can be minimized or eliminated by: (1) improving public safety receivers to reduce their sensitivity to out-of-band signals; and (2) at the site of the broadband transmitter, ensuring that the signal from the public safety desired narrowband transmitter is strong in relation to the undesired signal from the commercial broadband transmitter, so that the public safety signal is received even by a desensitized public safety receiver. This can be accomplished by changing the design of the antennas used by the broadband system and, potentially, by increasing public safety signal strength.

Intermodulation. Interference from intermodulation is caused when two or more strong signals enter into and mix within the public safety narrowband receiver to create undesired signals. When the new, mixed signal happens to be at the frequency of the desired narrowband communication channel, it causes interference to the desired signal. This interference is actually created within the narrowband receiver itself and will occur

only when the received signals (which could be public safety signals) are strong before they are mixed inside the public safety receiver. As a result, intermodulation can be an issue for public safety narrowband systems regardless of their proximity to commercial systems. Recently designed receivers are less prone to this type of interference than are the older receivers more widely used by public safety in other bands. With regard to signals from broadband systems, intermodulation may be less of an issue because broadband systems operate at relatively low energy per hertz, thus reducing the strength of any broadband signal received by—and the significance of interference to—public safety narrowband receivers. Thus, intermodulation interference resulting from the mixing of signals from broadband transmitters will likely manifest itself as background hiss or noise that would not be discernable as speech or communications in analog-type public safety radios, though it may desensitize both analog and digital radios. Compared to the situation in the 800 MHz band before it was reconfigured—where public safety channels were interleaved with commercial channels carrying signals of high energy density (*i.e.*, energy per hertz)—the proposed rebanding of the Upper 700 MHz band will be less likely to cause intermodulation interference. The details of interference from intermodulation of signals within the public safety narrowband receiver have not been carefully studied, however, and warrant further investigation. This is a general problem for public safety systems that is not specific to the A and B Blocks.

III. Broadband Applications for Public Safety

Just as the availability of broadband access is becoming ever more necessary for businesses and consumers, public safety agencies will find it increasingly useful to have broadband access, for both mission-critical and non-mission-critical applications. In

"enabling public safety agencies to develop a next generation network … policymakers should focus on making spectrum *generally* available for broadband uses."[15] Because of the nature of public safety use, which is highly mobile, this broadband access must be mobile. Today, public safety agencies have very limited access to spectrum that can be used for broadband applications; the available spectrum at 4.9 GHz is suitable for short-range transmissions but not particularly well-suited either for available mobile applications or for applications that require a signal to penetrate inside buildings.[16] As described above and more fully in Section C of the attached Appendix, 700 MHz spectrum is ideally suited for broadband applications, including the applications most critical for public safety.

A number of applications valuable to public safety agencies require spectrum suitable for mobile broadband, and NPSTC and APCO report that public safety agencies are increasingly recognizing the need for mobile broadband capability.[17] These applications include: real time, full motion video from any location to any other location; live video from an emergency scene to a command center; accessing building diagrams and mug shots from the field; mapping/location-based services; digital image transfers; large file transfers; and bio-terrorism detection and response information.[18] Both public and private sectors have expressed a strong interest in a mobile broadband platform to

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[15] *Taking a Fresh Look* at 23 (emphasis in original).

[16] Joint Comments of NPSTC and APCO, WT Docket No. 05-157, at 5 (April 28, 2005) ("NPSTC and APCO Comments").

[17] NPSTC and APCO Comments at 6.

[18] *See id.*; Comments of Lucent Technologies, Inc, WT Docket No. 05-157, at iii-iv (April 28, 2005) ("Lucent Comments").

foster governmental collaboration on public safety issues.[19] Enabling broadband in the A and B Blocks may also increase the options available to public safety, including public safety operations adjacent to commercial broadband operations, and mixed-use—commercial and public safety uses on the same spectrum, with priority given to public safety.

A. Enabling the Option of Broadband Within the Public Safety Blocks

Currently, the Public Safety Blocks are configured with wideband applications[20] in the center and narrowband applications at the edges; there is no provision for broadband in the current public safety configuration. As described in more detail below, if public safety were to reconfigure the Public Safety Blocks to place new broadband applications at the edges, that would have the advantage of minimizing interference received from a commercial or mixed-use broadband service in the immediately adjacent spectrum. In addition, using the spectrum directly adjacent to public safety in the Upper 700 MHz band, *i.e.*, the current A and B Blocks, together with a portion of current public safety spectrum for a mixed-use system could provide a quick, cost-effective path to broadband for public safety agencies.

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[19] *See generally* Lucent Comments at 8-17.

[20] Wideband operations are distinct from broadband operations; wideband operates on channels that are wider than narrowband, but significantly narrower than those required for broadband. For example, an application requiring a 12.5 kHz channel would be considered narrowband, and an application requiring a 150 kHz channel would be considered wideband. Broadband technologies, by contrast, typically require channels of approximately 1.25 MHz or greater and are capable of data throughput rates 6 to 15 times faster than wideband technologies can provide.

B. Enabling a Mixed-Use Option

Applications used for mission-critical operations traditionally have required dedicated spectrum.[21] There is some precedent, however, for public safety use of commercial services for non-mission-critical operations. For example, with their commercially-licensed spectrum, licensees are providing services including two-way dispatch, mobile data, microwave, and Internet access to the public safety community.[22] A "mixed-use" block of spectrum, designed to be used by both public safety agencies and commercial users, may bring the benefits of broadband to the public safety community in an expeditious and cost-effective manner while protecting public safety operations against interference from commercial operations. Wireline E911 traffic provides a possible example: such traffic receives priority treatment on the commercial wireline network. Similarly, modern prioritization and virtual private network technology could provide public safety traffic the highest priority on shared-use commercial wireless networks. As a result, public safety organizations could potentially share with commercial users the costs of deploying new next-generation wireless broadband infrastructure while still getting the priority and security they need.

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[21] *See generally* Comments of Enterprise Wireless Alliance, Inc., WT Docket No. 05-157, at 3 (April 28, 2005) ("Enterprise Wireless Comments"); NPSTC and APCO Comments at 8-9.

[22] *See* Enterprise Wireless Comments at 5-6; Comments of QUALCOMM Incorporated, WT Docket No. 05-157, at 7 (April 28, 2005).

IV. Licensing and Technical Issues

A. Licensing Issues

All of the options set out above involve increasing the size of the A Block by 500 kHz or more to enable it to carry broadband applications. This additional spectrum is currently contained within the B Block licenses, including those returned by Nextel and those held by existing licensees.[23] Option Two above requires an auction of the new B Blocks. All three options require the Commission to determine a methodology for valuing the additional spectrum added to the A Block and to establish a schedule for implementing such methodology.

1. Timing

Re-licensing A and B Block spectrum promptly will help spur deployment of broadband in the A and B Blocks under any of the rebanding options described above. Since the A and B Blocks have already been licensed, it makes sense under any rebanding plan to continue to license the A and B Blocks separately and not wait for the auction and licensing of C and D Block spectrum. In addition, we urge that proposed rule changes relating to the A and B Blocks should not be delayed pending any rule changes for either the C and D Blocks or the Public Safety Block, since entirely different considerations pertain.[24]

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[23] The B Block licenses that are not currently held by the FCC roughly cover the following states/geographic areas: Alaska (Harbor Wireless), Arkansas (Access Spectrum, L.L.C.), Iowa (PTPMS II Communications, L.L.C.), Kansas (Access Spectrum, L.L.C.), Louisiana (Motorola), Nebraska (Access Spectrum, L.L.C.), New Mexico (PTPMS II Communications, L.L.C.), Guam (Pegasus Guard Band, L.L.C.), N. Mariana Islands (Pegasus Guard Band, L.L.C.), and the Gulf of Mexico (Radiophone Nationwide PCS).

[24] The parties submitting this paper intend to file additional materials with a more detailed analysis of potential rule changes (such as changes to the technical rules and the

Only a fraction of the 700 MHz band has been licensed thus far: the 6 megahertz of A and B Block spectrum in the Upper 700 MHz band and 18 megahertz of spectrum in the Lower 700 MHz band. In this case, licensing spectrum in stages has enabled policymakers and companies to assess developments over time and make adjustments before licensing the remaining spectrum. For instance, if a particular technology turns out to need different spectrum blocks from those created under the initial band plan, it is much easier—both pragmatically and legally—for the Commission to adjust the band plan at an early stage, when much of the band remains fallow, rather than later when licensees have already commenced operations across the band. Companies will also be able to adjust their business plans before they have sunk a large amount of resources into a particular technology or strategy in a staged proceeding. By permitting the Commission and companies to make a series of mid-course corrections, the staged licensing and development of spectrum will increase the likelihood that the spectrum, in the long run, will be put to its most valuable use.

The history of the Upper 700 MHz A and B Blocks underscores the wisdom of licensing spectrum in stages. By licensing the A and B Blocks first, the Commission gave companies a chance to assess market and technological developments before committing full resources to particular products. The Commission also gave itself the flexibility to change its band plan and service rules for the 700 MHz band if market and technological developments warrant such changes.

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band manager restrictions) that may be necessary to implement the proposals contained herein.

2. Pricing and Compensation Issues

Under all three options, reconfiguring the Upper 700 MHz band in a manner that increases the size of the A Block to facilitate its use for broadband by incumbent licensees would also require adoption of rules governing the pricing of that additional spectrum. As confirmed by recent precedent, the Commission has legal authority to assign this spectrum to existing A Block licensees without holding an auction. Specifically, the Commission has found that it can limit eligibility for licensing in a given spectrum band to a single party, provided that this limit is based on a compelling public interest rationale.[25] If the Commission were to assign these additional frequencies at auction, the A Block might be split between two licensees, with neither having enough spectrum to support broadband operations, an outcome that would undercut the very purpose of the Commission's reconfiguration of the Upper 700 MHz band. Avoiding this risk may be a sufficiently compelling rationale to permit direct assignment of the additional spectrum to existing licensees.

The Commission also has legal authority to require existing A Block licensees to make payments to the U.S. Treasury in return for this additional spectrum.[26] In the past, the Commission has required fee payments based on the results of an auction of similar spectrum (in this case Nextel's returned B Block licenses would serve as a possible

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[25] *See 800 MHz R&O* ¶¶ 69-74; *Establishing Rules and Policies for the Use of Spectrum for Mobile Satellite Services in the Upper and Lower L-band*, Report and Order, 17 FCC Rcd 2704, ¶ 27 (2002).

[26] *See Mtel v. FCC*, 77 F.3d 1399, 1406 (D.C. Cir. 1996) (Commission has legal authority to require MTel to pay a license fee in return for a narrowband PCS license granted to MTel under the pioneer's preference policy); *800 MHz R&O* ¶¶ 75-76 (Commission has legal authority to require an "anti-windfall" payment from Nextel in conjunction with 800 MHz band reconfiguration and the assignment of 1.9 GHz spectrum to Nextel).

comparison), and on the Commission's own valuation of this spectrum (based on prices paid in recent secondary market transactions).[27]

Under all three options, the B Block would decrease in size, and in two of the options, the former B Block spectrum would become part of the Public Safety Block. Consequently, the current B Block licensees (aside from the FCC, which holds 42 of the 52 licenses) would have to be compensated fairly for this diminution of their license holdings. The Commission should seek comment on the best approach for compensating the B Block licensees, relying on the variety of precedents that the Commission has used or proposed in the past to achieve fair outcomes in analogous situations, and recognizing that an equitable compensation scheme for the existing B Block licensees is an essential part of achieving the goals described above.

B. Technical Issues

Rebanding the A and B Blocks must not result in undue interference to public safety operations. Historically, the Commission has addressed interference concerns by adopting technical rules regarding, among other things, out-of-band-emissions ("OOBE") limits. In developing these technical rules, the Commission historically has also considered the likely use of the commercial spectrum and has sought to develop technical rules that permit viable commercial operations.

1. Causes of Interference and Measures to Address Them

As discussed previously, there are a number of potential interference issues that must be considered and that can be avoided using a variety of established methods. For

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[27] *See Application of Nationwide Wireless Network Corp. for a Nationwide Authorization in the Narrowband Personal Communications Service*, Memorandum Opinion and Order, 9 FCC Rcd 3635, ¶ 20 (1994); *800 MHz R&O* ¶¶ 136-143; *see also 800 MHz R&O* ¶¶ 279-297.

example, there is a potential for interference to public safety operations caused by out-of-band emissions from adjacent commercial operations. Second, signals from adjacent operations could cause power overload in public safety receivers and cause interference. A third potential cause of interference to public safety systems could be intermodulation of multiple signals within the public safety receivers. The Commission should consider each of these and determine for each proposed rebanding option whether the interference likely to result from each of these causes would be significant, and if so, what technical rules can be developed consistent with broadband systems that would adequately protect public safety from interference caused by adjacent commercial broadband service.

There are also a variety of economical ways to address interference issues; sometimes, resolution will require a combination of protective measures, rather than just one. Perhaps the single most effective measure to prevent interference from a broadband application to an adjacent public safety operation would be for the public safety operation also to be broadband. As mentioned above, if the public safety operation at the band edge is broadband, the interference issues are greatly reduced. Indeed, if this public safety broadband operation and the adjacent commercial operation use compatible technologies, the interference issues may be largely eliminated.

Another way to resolve some interference issues may be the placement of improved filters at commercial base stations. Although this option may not be viable for mobile transmitters because of size and power considerations, it is likely to be far more workable to place such filters on base station transmitters. These filters would work to reduce the amount of emissions from the commercial broadband system outside its designated band.

A simple and often effective method of reducing interference is to designate a small segment of spectrum between public safety and adjacent operations to act as a buffer. The appropriate size of that buffer may be strongly affected by any other protective measures to be implemented. The Commission should consider all of these ways of addressing interference issues and determine the extent to which they could be used to protect public safety from interference caused by adjacent operations, while still permitting the adjacent spectrum to be put to its highest and best use.

For example, as mentioned previously, it may benefit public safety to consider re-channelizing its spectrum to reduce conflicts between its own broadband and non-broadband (narrowband and wideband) operations. Although all 24 MHz of spectrum in the Public Safety Block has been channelized, little of it is in use because of broadcaster encumbrance. If re-channelization is to occur, that process should begin now before any additional time is invested in planning.

Multiple strategies for reducing interference might be applied to address a given situation. For example, in each rebanding option described above, the point at 776 MHz where the Public Safety Block meets adjacent commercial spectrum may raise concerns about interference in the Public Safety Block from the adjacent commercial application. Such concerns may be mitigated by configuring the C Block in Options One and Two and the A Block in Option Three so that the commercial base station is transmitting on the upper segment and receiving on the lower segment. In addition, improved filters on the commercial base transmitters would help prevent out-of-band emissions from leaking into the public safety spectrum. Finally, placing the commercial operation slightly away

from the 776 MHz edge—as is often the case for commercial technologies—would further help mitigate interference concerns.

The receiver overload issue arises from undesired strong signals entering the sensitive front ends of public safety radios. Such out-of-band signals are able to gain entry because the public safety receiver, though tuned for maximum sensitivity within band, cannot reject all signals transmitted on nearby spectrum. Thus, when a public safety receiver is near an undesired transmitter and is far from the desired public safety transmitter, the desired signal may be overpowered by the undesired signal in the public safety receiver. While this is an issue that warrants continued exploration, our preliminary research indicates that public safety receivers have improved their ability to reject such undesired signals in recent years, thus decreasing the significance of this problem. In particular, it appears that the receiver overload issue is likely to be a problem only when the receiver is in extremely close proximity to (*e.g.*, within 100 yards of) the undesired transmitter. Finally, as mentioned above, ensuring that the desired public safety signal is strong in comparison to the undesired commercial signal would help address this issue.

The intermodulation problem described above occurs when multiple relatively strong transmissions on differing frequencies mix within the public safety receivers to create undesired, on-channel interference. There is an increased risk of this type of interference when transmission channels are spectrally interleaved, geographically proximate, and carry transmissions of high energy density, as were commercial and public safety channels at 800 MHz. While further study is required to refine the assessment of this issue, preliminary analysis indicates that intermodulation is far less

likely to be a problem at 700 MHz, where the channels are not spectrally interleaved and where the commercial transmissions are of relatively low energy density.

2. Narrowband Rules in a Broadband World

Certain technical rules currently applicable to the A and B Blocks were designed for narrowband operations and do not fit in a broadband world. These technical rules should be replaced with rules that do not unnecessarily interfere with the commercial viability of broadband operations, while still protecting public safety from undue interference.

Cellular Architecture Prohibition. Operators in the Upper 700 MHz A and B Blocks currently are prohibited from "employ[ing] a cellular system architecture."[28] At the time the Commission adopted this cellular prohibition, it was expected that the A and B Blocks would be used for private wireless services.[29] Typically, such private radio services would be provided efficiently over high-power, high-site non-cellular system architectures. Today, however, the broadband operations envisioned for the A and B Blocks would almost certainly be low-power, low-site cellular systems in order to achieve the capacity, throughput, and service quality required for such broadband operations. As a result, if the prohibition on cellular architecture is retained, it could prevent the deployment of broadband operations in the A and B Blocks by private wireless users, commercial providers or even public safety. There are alternative ways to protect public safety from A and B Block interference without this blanket prohibition.

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[28] 47 C.F.R. § 27.2(b); *see also Upper 700 MHz Second R&O* ¶¶ 19-24.

[29] *See, e.g.*, *Upper 700 MHz Second R&O* ¶ 32 (regarding likely services in the 700 MHz Guard bands, citing example of "end users such as railroads or pipelines").

The rules recently adopted in the *800 MHz R&O*, for example, are based on the premise that not all cellular operations are likely to cause interference. In that order, the Commission divided cellular and non-cellular architecture systems into discrete spectrum blocks and prohibited the deployment of "800 MHz cellular systems" in the non-cellular portion of the band without a waiver. In defining "800 MHz cellular systems," however, the Commission targeted "high-density" cellular systems that present a significant threat of harmful interference to public safety communications, while excluding system architectures that "that pose little or no likelihood of harmful interference."[30] Thus, the Commission permitted cellular architectures where they were not likely to cause interference. The Commission should consider whether the current cellular prohibition could be modified to restrict only those wireless architectures that would cause harmful interference to adjacent-band public safety systems.

Alternatively, the Commission should address the cause of the interference, which is not the cellular architecture itself; rather, it is the relatively strong signal levels that may exist in the immediate vicinity of cellular stations, especially in areas where the desired public safety signal level is low. Thus, as an alternative to banning the deployment of cellular base stations, the Commission could mitigate interference potential by adopting rules to limit broadband signal levels near the commercial transmitting base stations at ground level. This can be accomplished by a combination of technical solutions including increased antenna height, antenna beamtilt, and increased

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[30] *800 MHz R&O* ¶ 172 (defining "800 MHz cellular system" as: "(1) a system having more than five overlapping interactive sites featuring hand-off capability; and (2) any one of such sites has an antenna height of less than 100 feet above ground level with an antenna height above average terrain (HAAT) of less than 500 feet and more than twenty paired frequencies.").

antenna directivity. Such an approach would adequately protect public safety while allowing the deployment of cellular broadband networks.

Where spectrum is not adjacent to that used by narrowband public safety systems (such as both A Block segments in Option Two and the lower A Block segment in Option Three, above), such interference issues are not a concern. Such non-adjacent spectrum may thus be treated differently from other spectrum that is adjacent to that used by public safety operations. For example, the technical rules applicable to the C and D Blocks may be more appropriate for this non-adjacent spectrum.

Adjacent Channel Power Rules. Another narrowband-era rule the Commission should revisit imposes emissions limits for the Upper 700 MHz A and B Blocks that include extensive "adjacent channel coupled power" ("ACCP") requirements.[31] Codified in section 27.53(d),[32] this complex framework (subsequently renamed "adjacent channel power" ("ACP")[33]) was initially designed as an alternative to the traditional use of emissions masks in order to minimize interference from out-of-band emissions (OOBE) among public safety operations in the 764-776 MHz/794-806 MHz band. Subsequently, the Commission extended these same ACP requirements to the A and B Blocks to prevent narrowband services deployed in the A and B Blocks from interfering with systems operating in adjacent public safety spectrum.[34]

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[31] *Upper 700 MHz Second R&O* ¶¶ 16-17.

[32] 47 C.F.R. § 27.53(d).

[33] *Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communication Requirements Through the Year 2010,* Fifth Memorandum Opinion and Order, Sixth Report and Order, and Seventh Notice of Proposed Rulemaking, 20 FCC Rcd 831, ¶ 18 (2005).

[34] *See Upper 700 MHz Second R&O* ¶ 17 ("equipment operating in the Guard Bands will have to adhere to the same ACCP OOBE criteria that we adopted for 700 MHz

As currently constructed in the FCC's Rules, the ACP requirements set forth OOBE limitations for transmitting devices of specific operating bandwidths. Because initial development of ACP values was intended for narrowband applications, the existing ACP tables provide limits for 6.25 kHz, 12.5 kHz, 25 kHz and 150 kHz transmitters,[35] all of which are insufficient to accommodate broadband applications that require channels on the order of 1.25 MHz. The use of ACP tables as an alternative to emissions masks has proven to be an inflexible method that is not well suited to commercial frequency bands that are not configured for standard technologies operating within standard bandwidths.[36] The flexibility necessary for commercial broadband development strains the ability of the regulatory process to provide new ACP values for new equipment designs. Because any out-of-band emission restrictions to protect public safety should be compatible with broadband systems, the existing reliance on ACP limits should be replaced with out-of-band emissions restrictions.

V. Conclusion

The Upper 700 MHz A and B Blocks offer a rare opportunity to foster deployment of next-generation wireless broadband services in the very near term. By reconfiguring the spectrum, the FCC could meet its stated goals of facilitating the

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public safety users"); *Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010*, First Report and Order and Third Notice of Proposed Rulemaking, 14 FCC Rcd 152, ¶¶ 137-138 (1998).

[35] *See* 47 C.F.R. §§ 27.53(d)(1), 90.543(a).

[36] In the 4.9 GHz band, for example, the FCC adopted the use of emissions masks rather than using ACP for broadband public safety devices in part because the operational bandwidths for 4.9 GHz devices were not standardized at the time that the rules were proposed. *See, e.g.*, Comments of Motorola, WT Docket No. 00-32, at 13 n.11 (July 8, 2002).

deployment of broadband services, providing a broadband capability otherwise unavailable to public safety, and increasing the value realized by the U.S. Treasury. Several fortuitous events provide the FCC with a unique opportunity to move quickly to take full advantage of this opportunity. First, with the return of Nextel's B Block spectrum, the FCC is the largest holder of Upper 700 MHz licenses, thereby creating a favorable dynamic for any rules change. Second, due to the deferral of the auction of the Upper 700 MHz C and D blocks, those blocks can be easily shifted or altered to accommodate the new broadband opportunities. Finally, licensees constituting 97 percent of the Upper 700 MHz licenses not held by the FCC have set forth in this paper a win-win proposal after extensive consultation with other potential constituencies. The FCC has a rare moment to work with the affected parties to create a greatly improved spectrum policy that will facilitate its own mandate. Without the rebanding, the A and B Blocks will continue to be under-utilized. As soon as possible, the Commission should consider the rebanding and deregulatory options described above, and initiate a Notice of Proposed Rulemaking to adopt a new band plan and rules that maximize the potential use for broadband operations while protecting public safety operations from interference.

APPENDIX

A. Background

As part of the transition to digital television ("DTV"), Congress in 1997 required incumbent analog broadcasters to vacate channels 60-69 once certain conditions were met and directed the Commission to allocate the corresponding 700 MHz spectrum to public safety and commercial use.[37] The Commission subsequently took a number of steps to comply with this directive. In the Upper 700 MHz band (746-806 MHz, comprising television channels 60-69), the Commission allocated 24 megahertz to public safety and 36 megahertz to commercial wireless, including 6 megahertz of A and B Block spectrum. The Commission also allocated all of the Lower 700 MHz band (698-746 MHz, comprising channels 52-59) to commercial use and completed auctions for 18 megahertz of that spectrum in 2002.

Nine entities, including Access Spectrum, Pegasus, and Nextel, initially acquired A and B Block licenses in the Upper 700 MHz band through auctions in 2000 and 2001. Because the geographic areas for these A and B Blocks are Major Economic Areas ("MEAs"), there are 52 A Block licenses and 52 B Block licenses. In 2004, as part of the *800 MHz Rebanding Proceeding*, the Commission accepted Nextel's offer to turn in its

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[37] Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997) ("BBA"). Relevant portions of the BBA were codified in sections 309(j) and 337 of the Act, or were included as a footnote to section 309(j). *See* 47 U.S.C. §§ 309(j) & 337.

42 B Block licenses,[38] and stated it would commence a proceeding to determine how best to use that returned spectrum to serve the public interest.[39]

The return of Nextel's B Block licenses and the associated rulemaking proceeding present an excellent opportunity for the Commission to reband the Upper 700 MHz band in a manner that optimizes broadband use in the A and B Blocks while continuing to protect public safety operations at 700 MHz.

B. <u>The Importance of Broadband</u>

Chairman Martin has aptly described the importance of broadband: "I think that the opportunity for the growth of individuals and for our society by increasing that connectiveness through broadband is critical, so I think that is our No. 1 priority."[40] In the eleven months that have passed since the Commission first decided to hold a rulemaking on this spectrum, the United States has dropped from 13th to 15th among nations in broadband penetration, and trends indicate that the United States will drop to 21st by the end of 2005.[41] As the graph below clearly illustrates, the need to open this

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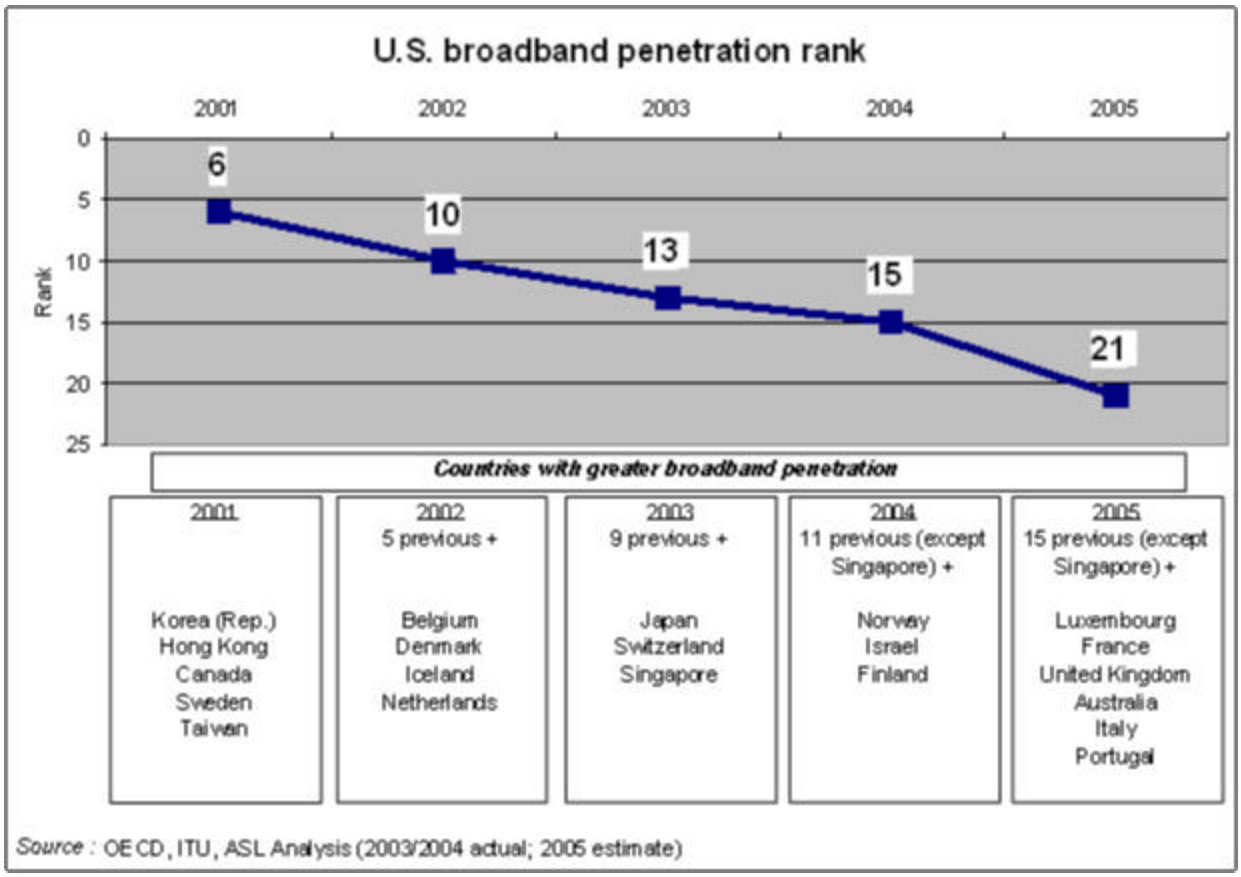
38 Today, of the 52 A Block licenses, Pegasus Guard Band, L.L.C. holds 32, Access Spectrum, L.L.C. holds 18, Dominion 700, Inc. holds 1 and PTPMS II Communications, L.L.C. holds 1. Of the 52 B Block licenses, the Commission is holding the 42 licenses turned in by Nextel, Access Spectrum holds 3 licenses, PTPMS II Communications and Pegasus hold 2 each, and Motorola, Harbor Wireless, and Radiofone PCS each hold 1 license.

39 *See 800 MHz R&O* ¶¶ 208-209; *800 MHz Recon Order* ¶ 8 n.19.

40 "FCC Chief: Broadband Is Top Priority," *Technology Daily* (May 27, 2005).

41 *See* International Telecommunication Union, "Economics by broadband penetration," 2003, *available at*: <http://www.itu.int/ITU-D/ict/statistics/at_glance/top20_broad_2003.html>; *id.*, 2004, *available at*: <http://www.itu.int/ITU-D/ict/statistics/at_glance/top20_broad_2004.html>. *See also* Organisation for Economic Co-operation and Development, OECD Broadband Statistics, December 2004, *available at*: <http://www.oecd.org/document/60/0,2340,en_2825_495656_2496764_1_1_1_1,00.html>. Where OECD and ITU statistics differed for a country, an average was taken, resulting in the rankings used here.

spectrum to business entrepreneurs to create increased broadband competition and to expand the options available to broadband users is important for American competitiveness and for the American consumer.



C. Why 700 MHz Is Ideally Suited For Broadband

The commercial spectrum at 700 MHz is ideally suited for new, innovative offerings, including broadband, and that fact has been widely recognized. The 84 megahertz of commercial spectrum in the Upper and Lower 700 MHz bands is particularly desirable for broadband applications because of its "excellent propagation

characteristics."[42] Such characteristics give 700 MHz spectrum real, tangible advantages for commercial broadband services, including significantly reduced capital costs for necessary service infrastructure,[43] particularly in rural areas.[44] It is well-established that for a given level of signal quality over a given coverage area, 700 MHz frequencies may require fewer than half as many antennas and use less power than higher frequencies.[45] Moreover, 700 MHz spectrum provides much better building penetration than higher frequencies, a critically important advantage for public safety systems.

Such attributes have led the Commission to conclude repeatedly that the 700 MHz band is "well suited to advanced services"[46] and have prompted Congress to find that the FCC "should have the flexibility to auction frequencies in the 700 megahertz band" for

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[42] Comments of CTIA—The Wireless Association, WT Docket No. 05-157, at 5 (April 28, 2005); *see also* Statement of Peter K. Pitsch, Director, Communications Policy, Intel Corporation, Before the Subcommittee on Telecommunications and the Internet, United States House of Representatives, at 8 (May 26, 2005), *available at*: <http://energycommerce.house.gov/108/Hearings/05262005hearing1533/Pitsch.pdf> ("Intel May 2005 Testimony") ("[F]requencies below 1 GHz are premier beach front property").

[43] Lucent Comments at 24 ("[T]he cost of network implementation is increasingly mitigated as one progresses further down the spectral band.").

[44] Intel May 2005 Testimony at 8 ("Intel believes the allocation of these frequencies for licensed use could dramatically accelerate broadband deployment with nationwide benefit, but with particular benefit to rural and underserved areas.").

[45] Testimony of Patrick P. Gelsinger, Chief Technology Officer and Senior Vice President, Intel Corporation, Before the Committee on Commerce, Science & Transportation, U.S. Senate (June 9, 2004), *available at*: <http://commerce.senate.gov/hearings/testimony.cfm?id=1220&wit_id=3516> ("Intel June 2004 Testimony").

[46] *Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59)*, Report and Order, 17 FCC Rcd 1022, ¶ 15 (2002) ("*Lower 700 MHz R&O*"); *see also id.* ¶ 81 (emphasizing that 700 MHz band plan should be consistent with the "goal of enabling new broadband services and advanced wireless services on [700 MHz] spectrum with propagation characteristics well suited for such applications.").

"third-generation wireless and other advanced communications services."[47] Most recently, the FCC's Wireless Broadband Access Task Force made the following recommendation: "Given that spectrum in the 700 MHz band is ideal for wireless broadband services, [the FCC should] expedite the transition of the Digital Television (DTV) spectrum for advanced wireless services and public safety, and facilitate its use during the interim period."[48]

In addition to the 700 MHz band's excellent propagation characteristics, its large segments of contiguous spectrum are also an important factor in making it such a natural fit for next-generation wireless broadband services. The band contains large segments of contiguous commercial spectrum: the entire 48 megahertz of the Lower 700 MHz band, as well as the two 18 megahertz blocks of the Upper 700 MHz band. These large blocks enable developers of technologies, equipment manufacturers, and service providers to achieve economies of scale. Also, the band's segments of contiguous spectrum are large enough to accommodate numerous broadband channels, which collectively can support a variety of devices, services, and competitors. Manufacturers, for instance, could mass produce a single radio that is broadly tuned for 700 MHz use, rather than producing smaller batches of different radio models, each of which is tuned to a discrete slice of spectrum. These radios could be incorporated into handsets, laptops and smart home technologies, and broadband services over those devices could be sold either *à la carte* or as part of a bundle.

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[47] Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat. 715, § 2(2), attached as Appendix A to *Auction Reform Act of 2002*, Report to Congress, 18 FCC Rcd 12556 (2003).

[48] "Connected on the Go: Broadband Goes Wireless," Overview of the Wireless Broadband Access Task Force Report, at 12 (Feb. 2005), available at: <http://www.fcc.gov/wbatf>.

The prospect of selling multiple devices that exploit common embedded technologies will not only make it cheaper to commercialize products in the United States, but also will enhance the ability of U.S. manufacturers, service providers, and other vendors to compete in foreign markets. As the Chief Technology Officer of Intel has stated, "[T]he benefits of the new wireless broadband services would be so compelling that a critical mass of other countries would quickly move to clear spectrum in [the 700 MHz] range. The resulting gains in economies of scale would give American consumers still lower prices and U.S. based companies important first to market advantages."[49] All of these advantages, in turn, will instill in manufacturers and service providers confidence that they will be able to recoup the costs of researching, developing, and commercializing products in the 700 MHz band.

Finally, because so few television stations operate at channels 60-69, the Upper 700 A and B Blocks are relatively unencumbered by broadcasters. As a result, in many markets the Upper 700 A and B Blocks can be put to commercial use today without interfering with existing television stations. In the Upper 700 MHz A and B Blocks, about 60 of the top 100 markets nationwide and approximately 60 percent of the U.S. population could be served today, in advance of the DTV transition.[50]

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[49] Intel June 2004 Testimony.

[50] For the public safety blocks in the Upper 700 MHz, the existence of commercial television stations is a significantly greater problem than it is for the A and B Blocks. Assuming protection of the co-channel and close adjacent broadcasters, use of the public safety blocks would require clearing channels 62, 63, 64, 65, 67, 68 and 69. The A and B Blocks are much smaller than the public safety blocks. Use of either the A or the B Block (while protecting co-channel and close adjacent broadcasters) only requires clearing four channels: 59, 60, 64 and 65 for the A Block; or 62, 63, 67 and 68 for the B Block. Thus the current encumbrance for the Upper 700 MHz A and B Blocks is much less severe than for the public safety blocks.

The use of commercial 700 MHz spectrum for broadband services and applications will promote competition and advance deployment of broadband services to the benefit of the public. The value of such "social benefits," including increased consumer welfare, public safety benefits, profits from spectrum-based services, and reduced need for federal financing, is estimated to be between $233 billion and $473 billion.[51]

These benefits would extend to traditionally underserved consumers. Because 700 MHz transmissions "pass easily through walls and trees, the 700 MHz band could jumpstart the deployment of more affordable wireless broadband connections, particularly in rural areas."[52] Even in areas where most homes and buildings are connected to wireline facilities, broadband applications (such as video surveillance cameras on corporate or school campuses) are desirable in many locations that cannot readily be "wired" to the network. The 700 MHz spectrum is ideally suited for connecting this type of site. In addition, as explained above, the unique traits of the 700 MHz band—including its size, contiguity, and propagation characteristics—make it

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[51] Coleman Bazelon, Vice President, Analysis Group, *Analysis of an Accelerated Digital Television Transition*, at 11-13 (May 31, 2005), *available at*: <http://www.itic.org/reports/DTV%20Transition%20Report.pdf>. *See also* Testimony of W. Kenneth Ferree, Chief, FCC Media Bureau, before the Subcommittee on Telecommunications and the Internet, U.S. House of Representatives at Sec. II (June 2, 2004), *available at*: <http://energycommerce.house.gov/108/Hearings/06022004/hearing1289/Ferree2037.htm> ("Not only would the immediate revenues from an auction of this spectrum potentially be enormous . . . but, more importantly, the advanced services that will be introduced in this spectrum could provide continuing benefits many times greater in terms of the economy, jobs, and international competitiveness.").

[52] J.H. Snider and Michael Calabrese, "Speeding the DTV Transition: A Consumer Tax Credit Can Unplug Analog TV, Reduce the Deficit and Redeploy Low-Frequency Spectrum for Wireless Broadband," New America Foundation, Spectrum Series Issue Brief # 15, at 1 (May 2004), *available at*: <http://www.newamerica.net/Download_Docs/pdfs/Pub_File_1575_1.pdf>.

likely that a critical mass of cutting-edge broadband technologies, services, and devices eventually will operate across the band. The resulting competition in price, features, and quality of service among wireless broadband providers will fuel a virtuous cycle in which competition begets greater demand for wireless broadband products and services, thereby spurring yet more competition, innovation, and demand.

A critical mass of broadband offerings in the 700 MHz band will not only foster *intramodal* competition among wireless broadband providers but also will provide another avenue for significant *intermodal* competition between wireless and wireline broadband providers. In order to foster intermodal competition for broadband services and applications in the near term, therefore, the FCC should make more spectrum below 1 gigahertz available for next-generation broadband wireless services. The resulting competition will not only provide a boost to the economy, but also it will advance innovation and further deployment of broadband services to consumers.