

The 700 MHz Guard Bands Are Essential To Stop Potential Interference To Public Safety And Commercial Licensees

Executive Summary

The FCC has long recognized the potential for technically incompatible systems and devices to interfere with one another when operated in close spectrum proximity. In its *Spectrum Policy Task Force Report*, the FCC noted that such incompatibility “can require additional constraints in the form of guard bands, consuming valuable spectrum, or expensive filtering to avoid adjacent band interference.”¹ The Task Force noted that grouping like systems or devices into spectrum “neighborhoods” would help to avoid this interference problem while maximizing spectrum efficiency.

In the case of 700 MHz, the Commission correctly established Guard Bands to protect against interference. In accordance with Congress’ mandate, the Commission was required to accommodate both advanced commercial wireless services and emergency communications services in the same 700 MHz spectrum band, recognizing that such services are likely to be incompatible. Consistent with its equally important mandate to protect public safety operations from harmful interference, the Commission concluded that it was necessary to separate “flexible use” commercial services from public safety services by establishing two sets of Guard Bands – the A and B blocks. In order to promote the maximum use of that spectrum for commercial purposes without causing harmful interference, the Commission licensed those Guard Bands with technical and operational rules that would ensure public safety is protected.

Now, some Guard Band licensees seek modifications to those rules, arguing that they are too restrictive and unnecessary to provide adequate protection to public safety. They are incorrect. Their analysis, provided in a report of the *700 MHz Technical Work Group*, is incomplete. The Guard Bands continue to be necessary to prevent harmful interference to public safety and commercial licensees. This paper demonstrates:

1. Guard Bands remain necessary at 700 MHz to separate incompatible services, including commercial cellular and non-cellular public safety deployments.
2. Reconfiguration of the public safety spectrum to consolidate narrowband and broadband uses has merit, but would not eliminate the risk of interference.
3. The interference potential at 700 MHz is the same type of interference present at 800 MHz, which required a hugely expensive rebanding effort with Nextel. Removing the Guard Band restrictions would create the same problems at 700 MHz.
4. Significant changes to the Guard Band rules would risk increased interference, and thus, are not warranted. However, additional flexibility could be provided to Guard Band Licensees subject to the condition that no harmful interference be caused to public safety licensees.

¹ *Report of the Spectrum Policy Task Force*, ET Docket No. 02-135, rel. November 2002, at 22.

Overview

On September 8, 2006, the Commission released a *Notice of Proposed Rule Making* (“NPRM”) which sought comment on rules applicable to Guard Band licensees in the 746-806 MHz (“Upper 700 MHz”) band.³ The NPRM asks whether additional flexibility should be afforded to 700 MHz Guard Band licensees and what the Commission should do with licenses that were recently reclaimed from Nextel.

The NPRM seeks specific comment on a proposal submitted to the FCC by 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. (collectively the “Guard Band Licensees”) that proposed substantial changes to the Commission’s Guard Band rules.⁴ The Guard Band Licensees argue that such changes would provide additional flexibility to existing licensees, make more efficient use of spectrum, and provide certain benefits to public safety. However, the changes proposed by the Guard Band Licensees would substantially increase the risk of interference to public safety and commercial licensees and reduce, not increase, spectral efficiency in the 700 MHz band.

As a prerequisite to implementing its plan, the Guard Band Licensees propose that the Commission modify its rules for the 700 MHz public safety spectrum (i.e., 764-776 MHz / 794-806 MHz) to better facilitate the deployment of broadband public safety systems. Specifically, they propose that the public safety spectrum be reconfigured to consolidate broadband uses in the 764-770 / 794-800 MHz bands and narrowband uses in the 770-776 / 800-806 MHz bands. They conclude that the deployment of broadband public safety systems in the spectrum adjacent to the 746-764 MHz and 776-794 MHz commercial bands – bands likely to accommodate commercial broadband systems – will substantially reduce the potential for interference and obviates the need for strict limitations on use of the Guard Band spectrum.

The Guard Band Licensees are wrong. The technical analysis conducted by the *700 MHz Technical Working Group* only addresses the potential interference to narrowband public safety systems and ignores the potential for interference to broadband systems. They incorrectly assume that commercial and public safety systems will not interfere with one another if both employ broadband technology. As the Commission concluded when it initially established its 700 MHz Guard Band rules, and again in its

³ *In the Matter of Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission’s Rules*, WT Docket No. 06-169, *Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010*, WT Docket No. 96-86, Notice of Proposed Rule Making, FCC 06-133 (“*Guard Band NPRM*” or “*NPRM*”), released September 8, 2006.

⁴ See 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., *Implementing the Vision for 700 MHz: Rebanding the Upper 700 MHz A and B Blocks for Next-Generation Wireless Broadband*, White Paper (filed Aug. 3, 2005) and 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., *Rules Changes to Implement the Proposed Rebanding of the Upper 700 MHz A and B Blocks for Next-Generation Wireless Broadband*, Supplemental White Paper (filed Nov. 4, 2005) (collectively “*Guard Band Proposal*”).

800 MHz Public Safety Rulemaking,⁴ commercial and public safety systems are incompatible because they employ different network architectures – cellular and non-cellular, respectively. The Commission concluded that these types of architectures are likely to interfere with each other, and as a result, should be spectrally separated to minimize the threat of interference. The Guard Band Licensees provide no evidence to reverse the Commission’s previous conclusions that Guard Bands are needed. Nor do they provide any evidence to suggest that public safety licensees will deploy broadband networks in a cellular configuration, as opposed to the manner in which they currently deploy narrowband systems.

In addition, the Guard Band Licensees fail to address the significant interference potential between high-power broadcast operations in the 698-746 MHz (“Lower 700 MHz”) band and low-power commercial mobile operations in the 746-806 MHz (“Upper 700 MHz”) band. The Commission previously concluded that those services are also incompatible, and that there is a significant potential for mobile systems to suffer harmful interference when operated near a high-power broadcast transmitter. It thus established a lower A block Guard Band at 746-747 MHz to separate these incompatible services. The Guard Band Licensees offer no analysis to demonstrate that removal of the A block Guard Band would not risk increased interference.

The Guard Band Licensees have failed to provide any evidence that their proposed changes would avoid harmful interference to public safety or commercial licensees. Consequently, there is no reason for the Commission to make any significant changes to its Guard Band rules.

There is, however, considerable merit in that part of the Guard Band proposal that would consolidate the narrowband public safety allocation, as that would better accommodate the introduction of broadband public safety systems and would promote more efficient use of the public safety spectrum. The public safety community has endorsed this proposed band reconfiguration.⁵ Notably, if public safety licensees decide in the future to deploy broadband systems in a cellular configuration, there might be justification to relax certain Guard Band rules including the cellular prohibition. In fact, the Commission has already provided in its rules a mechanism to provide such a determination – through its requirement that Guard Band licensees coordinate their uses of the band with public safety licensees.

Protecting Public Safety is of Primary Importance

In establishing its 700 MHz rules, the Commission made clear that its primary goal was to ensure that commercial operations in the band did not result in harmful

⁴ *In the Matter of Improving Public Safety Communications in the 800 MHz Band*, WT Docket No. 02-55, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order, FCC 04-168 (“800 MHz Rebanding Order”), rel. Aug. 6, 2004.

⁵ See Ex Parte Letter of the National Public Safety Telecommunications Council (“NPSTC”), WT Docket No. 06-169, filed Dec. 6, 2006.

interference to public safety licensees. In discussing its broad responsibility for managing the radio spectrum, it noted that protecting public safety against interference is a “core function of this Commission under Section 1 and Section 337 of the Communications Act.”⁷

The Commission correctly noted, however, that its responsibilities for protecting public safety operations in the 700 MHz band are even clearer. In conjunction with its mandate for implementing the transition to digital television and the subsequent repurposing of the 700 MHz spectrum, Congress specifically directed the Commission to allocate 24 MHz of spectrum for public safety use and to ensure that public safety licensees in the band “continue to operate free of interference from any new commercial licensees.”⁸ Thus, while the Commission is also obligated to ensure that the commercial spectrum is used as efficiently and effectively as possible, it must ensure that commercial uses of the spectrum do not interfere with public safety uses.

The Commission Determined That Guard Bands Are Necessary at 700 MHz

In establishing its rules for use of the 700 MHz commercial spectrum, the Commission was guided by its well-established principle that a flexible market-based approach is the most appropriate method for determining service rules for commercial spectrum.⁹ However, due to the circumstances present at 700 MHz, it concluded that the establishment of sub-bands would best ensure that all of the Commission’s spectrum management priorities were attained, including protection of public safety operations from harmful interference.¹⁰ Because of the significant potential for commercial operations to interfere with public safety operations, the Commission determined that a portion of the commercial spectrum should be designated as “Guard Bands” to separate the commercial and public safety segments of the 700 MHz band. Indeed, the Commission concluded that the use of such Guard Bands was “necessary to protect public safety users from interference.” (emphasis added)¹¹

To comply with its Congressional mandate that 36 MHz of spectrum in the Upper 700 MHz band be available for commercial use, the Commission did not prohibit use of the Guard Bands. Rather, it licensed this spectrum for commercial use and established a “package of interference protections modeled on the interference standards within the

⁷ *In the Matter of Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules*, WT Docket No. 99-168, First Report and Order, 15 FCC Red 476 (2000) (“*First Report and Order*”), rel. Jan. 7, 2000, at ¶3.

⁸ H.R. Conf. Rep. No. 105-217, 105th Cong., 1st Session, at 580 (1997).

⁹ *First Report and Order* at ¶3.

¹⁰ *First Report and Order* at ¶2. The Commission concluded that it needed to accommodate both commercial and public safety uses of the spectrum, while ensuring that public safety operations was protected from harmful interference.

¹¹ *First Report and Order* at ¶3.

700 MHz public safety spectrum.”¹² This includes out-of-band emission limits that are the same as those that apply to public safety,¹³ a prohibition on the use of the Guard Bands for cellular architectures,¹⁴ and a requirement for Guard Band licensees to coordinate with public safety licensees.¹⁵ In establishing these rules, the Commission provided assurances that the Guard Bands would be used in a manner that is compatible with public safety uses in the adjacent band.

In reaching its conclusions, the Commission relied heavily on analyses provided by Motorola that assessed the potential for interference in the Upper 700 MHz band and concluded that there was a substantial risk of interference between dissimilar services.¹⁶ Motorola’s analyses included the potential for interference between commercial mobile and public safety operations in the 746-806 MHz band, as well as the potential for TV broadcast operations below 746 MHz to interfere with 700 MHz commercial mobile systems.¹⁷ Motorola, in fact, was the first one to recommend the use of Guard Bands, with their attendant service and technical restrictions, as the best means to ensure adequate interference protection for public safety.¹⁸

Potential Interference Between Commercial Mobile and Public Safety Systems.

As a result of its extensive analysis, Motorola concluded that the cellular architectures likely to be deployed in the commercial segment of the Upper 700 MHz band are fundamentally incompatible with the non-cellular systems that are likely to be deployed by public safety licensees. Public safety licensees have typically deployed “high-site” systems that employ a single high-power base station to cover a very large service area. Commercial operators, by contrast, typically deploy “low-site” systems that employ many low-power base stations (or cell sites) to cover a comparable area. While cellular base stations typically operate at much lower power, they can cause harmful interference to public safety users under certain circumstances. Figure 1 illustrates this point.

¹² *In the Matter of Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules*, WT Docket No. 99-168, Second Report and Order, 15 FCC Rcd 5299 (2000) (“*Second Report and Order*”), released March 9, 2000, at ¶2.

¹³ 47 C.F.R. § 27.53(d).

¹⁴ 47 C.F.R. § 27.2(b).

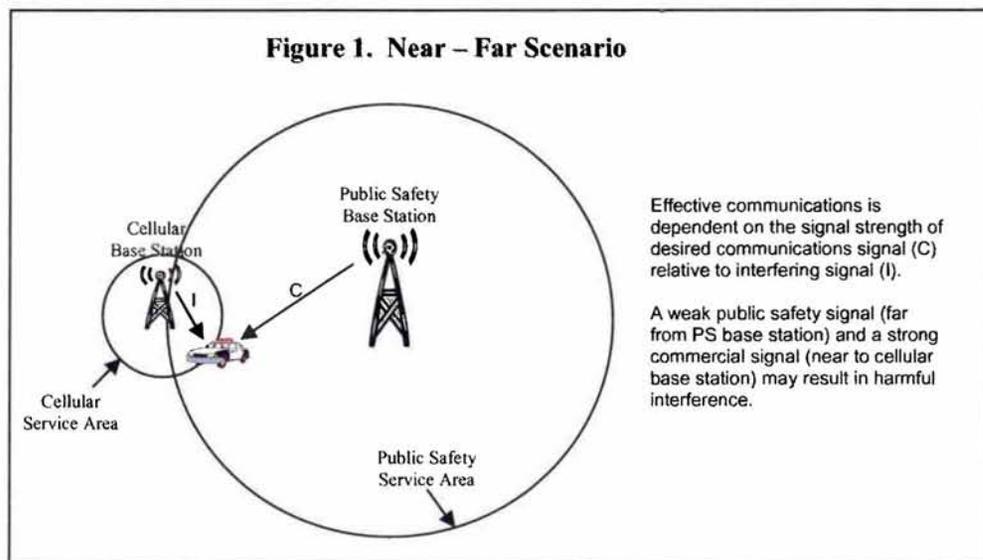
¹⁵ 47 C.F.R. § 27.601(d).

¹⁶ *Second Report and Order* at ¶19.

¹⁷ See Comments of Motorola, Inc., Attachment to Appendix A, *Interference From Cellularized Commercial Systems Into Public Safety Systems*, WT Docket No. 99-168, filed Jan. 18, 2000 (“*Motorola Analysis*”); see also Ex Parte Letter of Motorola, Inc., WT Docket No. 99-168, filed Jan. 24, 2000; see also Reply Comments of Motorola, Inc., in response to WT Docket No. 99-168, filed Aug. 13, 1999 (“*Motorola Reply Comments*”).

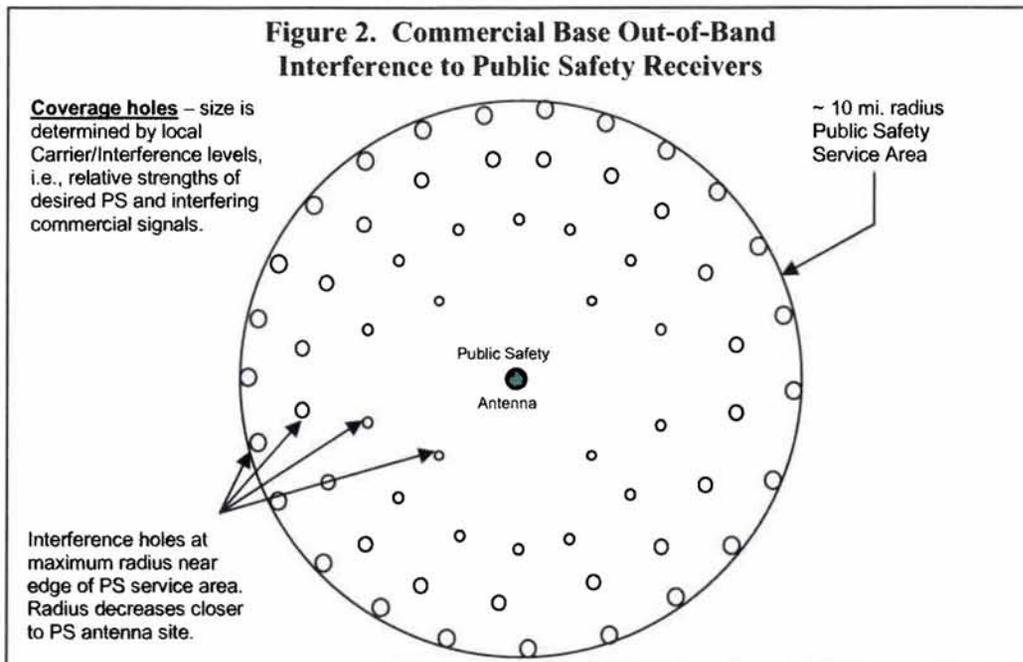
¹⁸ See Ex Parte Letter of Motorola, WT Docket No. 99-168, filed Sep. 15, 1999.

In this “near-far” scenario,¹⁹ a public safety user that is “far” from the base station with which it wants to communicate can experience harmful interference if it is also “near” to an interfering base station. If the desired public safety communications signal (C) is sufficiently weak and the interfering commercial signal (I) is sufficiently strong, there is a potential for the commercial signal to overpower the public safety signal, and effective communications will not be possible. This creates a “coverage hole” in the area around the interfering base station. The size of the hole depends on the relative signal strengths of the desired and interfering signals.



This problem is not limited to situations where the public safety user is on the edge of his/her service area, but can occur anytime the public safety signal is relatively weak, such as inside a building or when the signal is blocked by large obstructions such as buildings. As a result, coverage holes may exist around many commercial base stations that are located throughout the public safety service area. As shown in Figure 2, the size of these holes are likely to be smaller close in to the public safety base station and larger near the edge of the public safety service area. This reflects that fact that there is a greater probability that the public safety user will receive a weak signal as it moves farther away from its own base station.

¹⁹ Motorola provides a detailed description of the “near-far” problem in its analysis. *Motorola Analysis at Appendix A.*



This potential for interference is most severe when commercial operations are in the spectrum immediately adjacent to the public safety mobile receive band (i.e., 764-776 MHz). The use of filter technology in both the transmitter and receiver minimizes the potential for interference by reducing the out-of-band emissions (“OOBE”) produced by the transmitter and limiting the amount of emissions that can enter the receiver. However, there is a limit to what can be achieved with filter technology, given size, weight, and cost considerations. So, while a nominal OOBE limit might be sufficient to prevent interference from most commercial operations, more stringent limits are necessary for operations adjacent to the 764-776 MHz public safety band. As Motorola noted in its analysis, to avoid harmful interference to public safety, operations in the adjacent spectrum must be operationally and technically similar to public safety operations.²⁰ The Commission agreed, establishing OOBE limits that are comparable to that which applies to public safety operations and prohibiting cellular operations in the Guard Bands.²¹

The interference scenario described above is for a commercial base station transmitter interfering with a public safety mobile receiver. However, Motorola demonstrated that similar interference can occur when a public safety base station transmitter interferes with a commercial base station or mobile receiver or when a commercial mobile transmitter interferes with a public safety base station or mobile receiver.²² As a result, the Commission established Guard Bands at each point where the commercial and public safety segments of the band intersect.

²⁰ *Motorola Analysis* at 3.

²¹ *Second Report and Order* at ¶¶14-24.

²² See generally *Motorola Analysis*.

The potential for a commercial mobile transmitter to interfere with a public safety mobile receiver (“mobile-to-mobile interference”) is of particular concern since there is no way to determine in advance where mobile devices will be at any given time. Commercial operators and manufacturers have provided detailed analyses in other FCC proceedings describing the significant risk of mobile-to-mobile interference when mobile devices are within close physical proximity and when there is little spectral separation of mobile transmit and receive bands.²³ If a sufficient Guard Band is not provided to separate mobile transmitters and receivers, there is a high probability of harmful interference to public safety mobile devices whenever they are in close proximity to a commercial mobile device.

The public safety community supported Motorola’s analysis and the Commission’s conclusion that the Guard Bands are essential. The Association of Public Safety Communications Officials-International (“APCO”), the Federal Law Enforcement Wireless Users Group, the International Association of Chiefs of Police, the Major Cities Chiefs, and the Major County Sheriffs Association all supported the creation of the Guard Bands and the technical requirements established by the Commission as necessary to protect public safety operations from dissimilar commercial operations.²⁴ APCO, for example, noted it “strongly supports the creation of guard bands, which are necessary for the implementation of enforceable technical interference guidelines and specialized frequency coordination procedures to protect public safety users,” and also noted that the Guard Band rules established by the Commission are “more likely to lead to implementation of ‘like-kind’ operations in frequencies adjacent to the public safety bands, which will ease coordination and help avoid interference.”²⁵ The Guard Band Licensees provide no evidence to suggest that anything regarding the design and

²³ See Comments of CTIA-The Wireless Association, WT Docket No. 04-356 (“*CTIA Comments*”), filed Dec. 8, 2004; see also “PCS Handset Vulnerability to H-Block Transmissions – Interpreting the Test Results,” Declaration of Dr. Charles L. Jackson, included in *CTIA Comments*, filed Dec. 8, 2004; see also “PCS H Block Interference Tests,” Technical Report WINLAB-TR-264, Rutgers Wireless Information Network Laboratory, included in *CTIA Comments*, filed Dec. 8, 2004; see also “FCC H-Block Testing Report,” PCTEST Engineering Laboratory, Inc., included in *CTIA Comments*, filed Dec. 8, 2004; see also Comments of Motorola, Inc., WT Docket No. 04-356, filed Dec. 8, 2004; see also Joint Comments of Sprint Corporation and Verizon Wireless, WT Docket No. 04-356, “H-Block Impact on Incumbent PCS Operations,” V-COMM study, filed Dec. 8, 2004; see also Reply Comments of Cingular Wireless LLC, WT Docket No. 04-356, filed Feb. 8, 2005; see also “H Block Overload Test Results, Single Tone Desensitization (Overload) and Duplexer Testing Over Temperature,” included with Comments of Sprint Corporation, ET Docket No. 00-258, filed Sep. 1, 2004.

²⁴ See Comments of Association of Public Safety Communications Officials-International, WT Docket No. 99-168, filed Jan. 18, 2000 (“*APCO Comments*”); see also Letter from Ruben B. Ortega, Chairman, Major Cities Chiefs, dated Oct. 5, 1999, WT Docket No. 99-168, filed Dec. 2, 1999; see also Letter from Sheriff Patrick D. McGowan, President, Major County Sheriffs’ Association, dated Oct. 28, 1999, WT Docket No. 99-168, filed Dec. 2, 1999; see also Letter from Ronald S. Neubauer, President, International Association of Chiefs of Police, dated Oct. 18, 1999, WT Docket No. 99-168, filed Dec. 2, 1999; see also Letter from Julio R. Murphy, Department of the Treasury, and Derek M. Siegle, Department of Justice, both Co-Chairs of the Federal Law Enforcement Wireless Users Group, dated Nov. 17, 1999, WT Docket No. 99-168, filed Dec. 2, 1999.

²⁵ *APCO Comments* at 2.

development of public safety and commercial equipment has changed since the Commission established its Guard Band rules, and thus, no rational reason as to why they should be reconsidered now.

Potential Interference From Broadcast Services Below 746 MHz. While Motorola's analyses focused primarily on the potential for interference between commercial mobile and public safety operations in the 746-806 MHz band, it also concluded that there was a significant potential for high-power broadcast television services operating below 746 MHz to cause harmful interference to commercial mobile systems.²⁶ This interference is similar to the interference described earlier, and is a direct result of the incompatibility of low-power mobile and high-power broadcast services. The Commission previously concluded that such services are incompatible, and established rules that prohibited the use of the Upper 700 MHz band for broadcast systems.²⁷

Motorola's analysis highlights the potential interference from traditional broadcast TV services – services which will transition out of the 700 MHz band with the completion of the DTV transition. However, the Commission's decision to allow high-power broadcast services in the 698-746 MHz ("Lower 700 MHz") band subsequent to this transition makes the threat of potential interference very real. Under its current rules, fixed and base station transmitters in the Lower 700 MHz band can operate up to a maximum effective radiated power ("ERP") of 50 kilowatts,²⁸ while operations in the Upper 700 MHz band is limited to an ERP of 1 kilowatt.²⁹ This 50-to-1 difference in power can result in significant harmful interference to commercial mobile operations in the Upper Band. To minimize such interference, the Commission established a 1 MHz A block Guard Band at 746-747 MHz to separate the Upper and Lower 700 MHz bands and the potentially dissimilar services that might be deployed there.

Loss of this Guard Band would harm commercial operations. To avoid harmful interference, the commercial C block licensee (operating adjacent to the Lower 700 MHz band) would have to set aside 1 MHz of its licensed spectrum (746-747 MHz) as "internal guard band" that would not be used. Thus, without the Guard Band, the amount of spectrum available in the lower C block (746-751 MHz) would be reduced by 20%.³⁰ Moreover, by reducing the size of the block to 4 MHz, this spectrum would not be able to accommodate the advanced wireless technologies that require contiguous 5 MHz blocks.

²⁶ *Motorola Reply Comments* at 20.

²⁷ *First Report and Order* at ¶15.

²⁸ 47 C.F.R. § 27.50(c)(1).

²⁹ 47 C.F.R. § 27.50(b)(1).

³⁰ Setting aside 1 MHz of spectrum for "internal guard band" would reduce the amount of usable spectrum in the lower half of the commercial C Block from 5 MHz to 4 MHz. Since the C Block license uses paired spectrum, and will likely employ Frequency Division Duplex ("FDD") technology, only 4 MHz of the upper half of the C Block would be usable. Thus, only 8 MHz of the 10 MHz C Block license would be used, while 2 MHz would be unused.

Interference Potential at 700 MHz is Identical to Problems at 800 MHz

The potential interference that is likely to occur in the 700 MHz band is the same type of interference that has existed in the 800 MHz band for years. In its *800 MHz Public Safety Rulemaking*, the Commission found that public safety users in a fringe coverage area can experience harmful interference when in close proximity to commercial base stations. It concluded that these interference problems were caused by an incompatible mix of two types of communications – commercial cellular and non-cellular public safety systems.³¹ This is the same “near-far scenario” described above.

The Commission concluded that it was necessary to separate these incompatible services to resolve the interference, and initiated an expensive and burdensome band reconfiguration process to accomplish this objective.³² Importantly, the separation of dissimilar services in the 700 MHz band has already been ensured with the Commission’s establishment of its current Guard Band rules. Reversing that decision would risk substantial interference to public safety, and could necessitate a similar band reconfiguration in the future. That would result in unnecessary cost and operational burdens to public safety and commercial licensees alike.

Put another way, removing the Guard Bands as the Guard Band Licensees propose would recreate precisely the same public safety – commercial use interference problem that forced the Commission to order the enormously complex, expensive, and burdensome rebanding effort in the 800 MHz band.

The Guard Band Proposals Would Cause Harmful Interference

The Guard Band Licensees have submitted two separate proposals to the FCC, each recommending substantial changes to the Commission’s rules. The first – which they call the “*Broadband Optimization Plan*” – would eliminate the A block Guard Band and provide broad flexibility in the B block Guard Band. The second – which they call the “*Commercial 700 MHz Plan*” – would eliminate both the A and the B blocks and expand the amount of spectrum available in the upcoming commercial auction.

One aspect of these proposals has merit. To facilitate more efficient deployment of broadband systems by public safety licensees, each proposal would require the reconfiguration of public safety’s 700 MHz spectrum to consolidate narrowband and broadband systems into opposite ends of the band.³³ As noted previously, such a reconfiguration would yield benefits to public safety licensees.

³¹ *800 MHz Rebanding Order* at ¶ 2.

³² *800 MHz Rebanding Order* at ¶21-23.

³³ The Commission is currently considering changes to the 700 MHz public safety spectrum as part of a separate ongoing proceeding. See *In the Matter of the Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State, and Local Public Safety Communications Requirements Through the Year 2010*, WT Docket No. 96-86, Eighth Notice of Proposed Rule Making, FCC 06-34 (“*Public Safety 8th NPRM*”), rel. Mar. 21, 2006; see also *In the Matter of Implementing a*

However, the rest of what the Guard Band Licensees propose should not be adopted. The Guard Band Licensees contend that neither of their proposals would risk harmful interference to public safety licensees. In fact, they argue that both would result in less interference. In support of that argument, they recently submitted to the FCC a report from the *700 MHz Technical Working Group* (“*TWG*”), an informal working group they created to address various technical issues related to their proposals.³⁴

The *TWG Report* concludes that the *Broadband Optimization Plan* (“*BOP*”) would result in less interference to narrowband public safety systems, and attributes that improvement to the increased spectral separations between these systems and commercial systems operating in the commercial bands. This conclusion is accurate and supported in the *TWG Report*. However, the reduction in potential interference to these narrowband systems is entirely the result of the proposed reconfiguration of the public safety band. Changes to the Guard Band spectrum are not needed or necessary to achieve this outcome. As previously noted, such a reconfiguration would yield various benefits to public safety, including less interference into narrowband systems.

Unfortunately, that is where the *TWG* analysis ends. The *TWG Report* says nothing about the potential for interference into the broadband public safety systems that would occupy spectrum immediately adjacent to the Guard Bands. Presumably, the *TWG* assumes that commercial broadband systems and public safety broadband systems will be compatible simply because they both employ broadband technologies. That assumption is incorrect because the principal factor in determining whether interference will occur is how these systems are deployed and not which technologies are used. As the Commission has already concluded at least twice previously, cellular and non-cellular systems are incompatible in directly adjacent spectrum bands. It is possible that the *TWG* assumes that public safety would deploy broadband networks in a cellular configuration. If so, such an assumption is not stated in the report. It is also premature to make such an assumption, since the specifics associated with public safety deployment of broadband systems are still under development.

Should public safety licensees decide to deploy broadband systems in a cellular configuration, that still does not guarantee that no interference will occur. The density of those deployments (i.e., number of base stations or cells per square mile) relative to the density of commercial deployments is what will determine the magnitude of any potential interference. Moreover, since the Commission’s commercial rules are flexible, it is possible that commercial licensees could deploy non-cellular systems. In that case, broadband public safety networks deployed in a cellular configuration might experience harmful interference due to the incompatibility of cellular and non-cellular networks. Of course, that is precisely why the current Guard Band rules are necessary. Given the

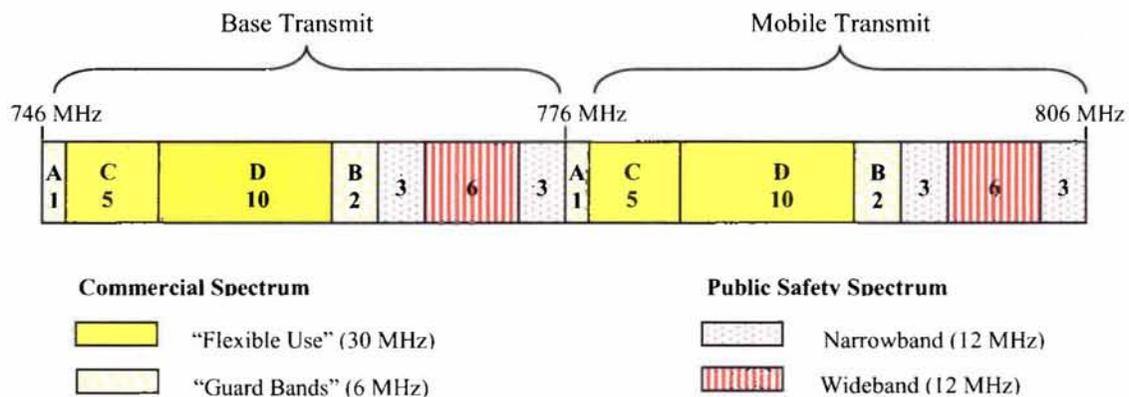
Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, PS Docket No. 06-229, Ninth Notice of Proposed Rule Making, FCC 06-181 (“*Public Safety 9th NPRM*”), rel. Dec. 20, 2006.

³⁴ *Second Report of the 700 MHz Technical Working Group*, in response to WT Docket No. 06-169 (“*TWG Report*”), filed Jan. 26, 2007.

uncertainty associated with commercial deployments and the significant potential for interference between commercial and public safety systems, it is necessary to have Guard Bands that separate the commercial and public safety bands and to impose a coordination requirement on any commercial use of those Guard Bands so that the Commission, and public safety, can be assured that those uses are compatible.

The following sections describe specific problems associated with the two proposals submitted to the FCC by the Guard Band Licensees. For reference, an illustration of the current Upper 700 MHz band plan is provided in Figure 3.

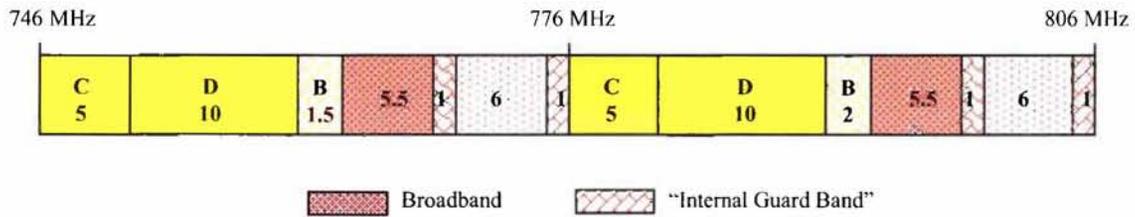
Figure 3. Current Upper 700 MHz Band Plan



Broadband Optimization Plan (“BOP”). The Guard Band Licensees proposed (1) to eliminate the A block Guard Bands (746-747 MHz and 776-777 MHz), (2) to reduce the size of the B block Guard Bands from 2 MHz to 1.5 MHz each (proposed to occupy 761-762.5 MHz and 791-792.5 MHz) and afford broad flexibility in its use, and (3) reallocate 3 MHz of the Guard Band spectrum for public safety use.³⁵ Figure 4 illustrates this proposal.

³⁵ In its *BOP* proposal, the Guard Band Licensees rename the B Block as the A Block, consistent with its plan to flip their current A Block licenses for this more preferred spectrum. However, to avoid confusion in describing the changes that are proposed, we retain the current B Block designation.

Figure 4. “Broadband Optimization Plan”



The *BOP* would increase the potential for interference to both commercial and public safety licensees. First, the *BOP* would eliminate the lower A block (746-747 MHz) and shift the entire band plan down 1 MHz such that the commercial C block is immediately adjacent to the Lower 700 MHz band at 746 MHz. The loss of this Guard Band would risk increased interference to the commercial C block licensee from high-power broadcast systems operating below 746 MHz. As already discussed, this could require the C block licensee to designate a portion of its licensed spectrum as guard band, and could reduce its effective spectral capacity by 20%.³⁶

Second, the *BOP* would eliminate the upper A block (@ 776 MHz) and reallocate this spectrum to public safety (along with the 805-806 MHz block). Elimination of this Guard Band would risk harmful interference to public safety – if that spectrum is used by public safety. The *BOP* proposes, however, that the 775-776 MHz and 805-806 MHz bands be designated as unused public safety “internal guard bands.” If that is the case, then there would be no greater risk of interference than under the current rules since there would be 1 MHz of separation between public safety and the commercial C block. However, the Commission’s rules would have to stipulate that those bands could not be used for public safety operations, or if they were used that public safety licensees would not be entitled to any protection from harmful interference. Allowance of protected public safety operations in the band would effectively shift the guard band into the commercial C block and reduce the effective capacity available to the C block licensee, as discussed above.

Importantly, because two megahertz would be designated as unused “internal guard bands,” the *BOP* would only provide one megahertz of additional spectrum to public safety and not three megahertz as the Guard Band Licensees claim. If that spectrum is to be restricted to unused “guard bands,” then there is no justifiable reason to change the current Guard Band designation.

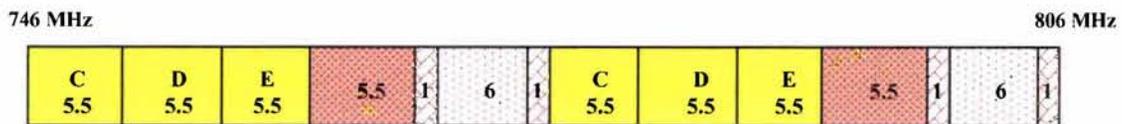
Removing the Guard Band restrictions from the B block licenses would also risk increased interference to public safety. As already discussed at length, there is a significant risk of interference between cellular and non-cellular systems. Unless the Commission is prepared at this time to dictate a universal deployment strategy for public

³⁶ As discussed *infra*, at 8.

safety, and require compatible deployments within the Guard Band, there is no justification for significant changes to the rules.

Commercial 700 MHz Plan. The Guard Band Licensees proposed (1) to eliminate both the A and B block Guard Bands (746-747 MHz, 762-764 MHz, 776-777 MHz, and 792-794 MHz), (2) increase the amount of “flexible” commercial spectrum from 30 MHz to 33 MHz, and (3) reallocate 3 MHz of the Guard Band spectrum for public safety use. Figure 5 illustrates this proposal.

Figure 5. “Commercial 700 MHz Plan”



Adoption of this plan would also increase the potential for interference to both commercial and public safety licensees. The impacts associated with elimination of the A block Guard Bands have already been noted. The elimination of the B block Guard Bands would have the same interference effect on public safety operations as that caused by the *BOP*, because under either proposal the spectrum adjacent to the public safety spectrum would be subject to broad flexibility including the potential to be used for cellular systems with less stringent OOB limits.

This plan, however, raises additional concerns for prospective commercial operators in the Upper 700 MHz band. If adopted, and public safety licensees deploy broadband systems that are incompatible with commercial operations, the new commercial E block licensee will be severely affected. First, it could be subject to harmful interference from public safety operations that are incompatible. Second, given the standards that the Commission has established for protecting public safety, the E block licensee could have diminished use of its licensed spectrum. The analysis provided here demonstrates that there is a significant potential for harmful interference between incompatible systems. If public safety were to deploy incompatible systems and the Commission were to require the commercial E block licensee to fully protect public safety operations, the licensee would likely have to designate a significant portion of its licensed spectrum as “guard band” and ensure that spectrum remains unused. If two megahertz of “guard band” is required to provide the level of protection expected by the Commission, then 36% of the E block would be unusable. Moreover, by reducing the amount of contiguous spectrum available to the E block licensee from 5.5 MHz to 3.5 MHz, it would prevent the E block licensee from deploying broadband wireless technologies that employ bandwidths of five megahertz or more.

Additional Flexibility Should Be Conditioned on Protecting Public Safety

While the Guard Bands cannot be removed without creating multiple harmful interference problems, the Commission could make modest changes to the Guard Band rules now, while providing clear guidance on how additional flexibility could be afforded in the future conditioned on the requirement that public safety not be subject to increased interference. The current requirement that Guard Band licensees must lease the predominant amount of their spectrum to non-affiliates,³⁷ for example, is not necessary to avoid interference. In fact, it could frustrate efforts to promote compatible, non-interfering uses of the Guard Bands because it would promote a larger number of potentially incompatible operators in the band.

Elimination of the current prohibition on deploying cellular architectures and/or significant modifications to the current OOB limits would be more problematic given the significant potential for interference. However, it has already been shown that the potential for B block Guard Band licensees to cause harmful interference to public safety licensees will depend on how new broadband public safety systems are deployed. If Guard Band licensees in the B block can successfully coordinate with public safety licensees and demonstrate that their proposed systems are compatible with public safety systems, then they should be afforded the flexibility to deploy such systems. Beyond elimination of the non-affiliate rule referenced above, additional flexibility should not be afforded to Guard Band licensees in the A block as there continues to be a significant potential for interference to both public safety and commercial licensees that would not be improved with the deployment of broadband technology by public safety licensees.

Conclusion

This paper demonstrates that the proposals made by the Guard Band Licensees would risk significant interference to both public safety and commercial licensees, and thus, would undermine the principle objective of the Commission in establishing its 700 MHz rules and risk repeating the same problems that still exist in the 800 MHz band. This potential interference is a direct result of the strong likelihood that commercial and public safety licensees will deploy incompatible systems, i.e., cellular and non-cellular systems, respectively. The Guard Band Licensees ignore this fact. Given that the interference risks to public safety have not changed, it is clear that significant changes to the Guard Bands are not warranted. Furthermore, there is a clear technical requirement to maintain a guard band of spectrum between commercial operations in the Lower and Upper 700 MHz bands. Proponents of changes to the Guard Band rules have failed to address any of these significant interference concerns.

There is merit, however, in proposals to modify the Commission's rules to permit the operation of broadband systems in the public safety spectrum and to reconfigure that spectrum to consolidate broadband and narrowband uses into opposite ends of the band. It is possible that those changes, in conjunction with possible changes being considered

³⁷ 47 C.F.R. § 27.603(c).

under the Commission's *Public Safety 9th NPRM*, would increase the probability that commercial and public safety operations will be compatible. However, it is premature to assume that all future uses of the Guard Band and public safety spectrum would be compatible. Fortunately, there is no need for the Commission to make that determination here. The current Guard Band rules, with their requirement to coordinate with public safety licensees, provide the mechanism to ensure compatibility. If a Guard Band licensee wishing to deploy broadband cellular systems can successfully coordinate with affected public safety licensees, and can effectively demonstrate that no risk of interference exists, then it should have the flexibility to provide such services.

Application of the current Guard Band rules, including maintaining the current band plan, would provide the opportunity to use the Guard Band spectrum for commercial purposes, while ensuring that public safety is protected. More importantly, if broadband public safety systems evolve in a manner that is compatible with commercial deployments, it provides the opportunity to use the Guard Bands for public safety uses. Such an approach maximizes the potential use of the Guard Bands, while providing the necessary assurances that public safety is protected from harmful interference.