Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Promoting Interoperability in the 700 MHz Commercial Spectrum	)	WT Docket No. 12-69
	)	
	)	

COMMENTS OF UNITED STATES CELLULAR CORPORATION

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

During the more than two and one-half years since the 700 MHz Block A Good Faith Purchasers Alliance filed its Petition for Rulemaking, the need for Commission resolution of the current situation blocking the healthy development of competition among wireless providers holding Lower 700 MHz licenses has become increasingly urgent.

The Commission initiated this proceeding to promote interoperability in the Lower 700 MHz band and to encourage the efficient use of spectrum. The only reasons given to date for retaining a separate Band Class 17 subset of Band Class 12 is that it was necessary in order to prevent harmful interference from the Lower 700 MHz E Block and DTV Channel 51 to Lower 700 MHz B and C Block operations. However, the sole engineering study in the record provides clear evidence that concerns regarding harmful interference are unfounded. Given the undeniable substantial negative impact upon the Lower 700 device and roaming ecosystems that has resulted from the creation of Band 17 and the complete lack of any remaining legitimate countervailing argument for its existence, public interest considerations dictate that the Commission act during 2012 to undo the competitive damage that has been done and require interoperability for the benefit of all consumers.

USCC requests that the Commission do so by requiring that no later than 12 months from the effective date of an order or the end of 2013, whichever is earlier, that all mobile devices designed to operate on any Lower 700 MHz A, B or C Block frequencies must tune to all Lower 700 MHz A, B and C Block frequencies and incorporate mobile device architecture supporting Band 12 as defined in 3GPP standards.

AT&T's acquisition via commercial transactions of significant 700 MHz commercial paired spectrum holdings, coupled with its decision to deploy single 700 MHz band class devices rather than support parallel development of a 700 MHz broadband device ecosystem for Band Class 12, has severely impeded the competitive roll-out of 4G broadband coverage by Lower A

Block licensees, and thereby further disadvantaged these small and mid-tier carriers. It also has slowed consumer adoption of broadband in the many parts of the U.S. not served by AT&T and has reduced options for consumers to choose from a diversity of service providers based on features, price, and service quality. These harms, all of which the Commission has sought to address in the past through appropriately-tailored regulations, will continue to increase until the Commission requires interoperability throughout the Lower 700 MHz A, B and C Blocks.

USCC also requests that the Commission take related action to modify its rules for Lower 700 MHz D and E Block operations, consistent with the parameters set forth in the AT&T-Qualcomm Order, to address potential harmful interference to Band 12 device operations caused by the Lower E Block licenses that are not held by AT&T. USCC agrees with AT&T that harmonizing frequency uses in Lower D and E Block spectrum to avoid disruption in other Lower 700 MHz blocks, including AT&T's Lower 700 MHz D Block operations, would help unlock the full potential of the Lower 700 MHz spectrum.

Finally, USCC urges the Commission to impose monitoring and reporting obligations on Lower 700 MHz license holders and urges the Commission to take additional steps to begin clearing Channel 51 broadcast operations.

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United States Cellular Corporation ("USCC") submits these comments in response to the Notice of Proposed Rulemaking ("NPRM") released March 21, 2012 in the above-captioned proceeding.[1] The Commission "initiate[d] this rulemaking proceeding to promote interoperability in the Lower 700 MHz band and to encourage the efficient use of spectrum."[2] The Commission can do that by requiring that no later than 12 months from the effective date of an order or the end of 2013, whichever is earlier, that all mobile devices designed to operate on any Lower 700 MHz A, B or C Block frequencies must tune to all Lower 700 MHz A, B and C Block frequencies and incorporate mobile device architecture supporting Band 12 as defined in 3GPP standards.

The only reasons given to date for retaining a separate Band Class 17 subset of Band Class 12 is that it was necessary in order to prevent harmful interference from the Lower 700 MHz E Block and Channel 51 to Lower 700 MHz B and C Block operations. However, the engineering study in the record provides clear evidence that concerns regarding harmful interference are unfounded. Given the undeniable substantial negative impact upon the Lower 700 MHz device and roaming ecosystems that has resulted from the creation of Band 17 and the

[1] *Promoting Interoperability in the 700 MHz Commercial Spectrum*, Notice of Proposed Rulemaking, WT Docket No. 12-69, FCC 12-31 (rel. Mar. 21, 2012).

[2] NPRM at ¶ 5.

complete lack of any remaining legitimate countervailing argument for its existence, public interest considerations dictate that the Commission act during 2012 to undo the competitive damage that has been done and require interoperability for the benefit of all consumers.

USCC also requests that the Commission take related action to modify its rules for Lower 700 MHz D and E Block operations, consistent with the parameters set forth in the AT&T-Qualcomm Order,[3] to address potential harmful interference to Band 12 device operations caused by the Lower E Block licenses that are not held by AT&T Inc. ("AT&T"). USCC agrees with AT&T that harmonizing frequency uses in Lower 700 MHz D and E Block spectrum to avoid disruption in other Lower 700 MHz blocks, including AT&T's Lower 700 MHz D Block operations, would help unlock the full potential of the Lower 700 MHz spectrum. Finally, USCC urges the Commission to impose monitoring and reporting obligations on Lower 700 MHz license holders and urges the Commission to take additional steps to begin clearing Channel 51 broadcast operations.

INTRODUCTION

During the more than two and one-half years since the 700 MHz Block A Good Faith Purchasers Alliance (the "Alliance") filed its Petition for Rulemaking,[4] the need for Commission resolution of the current situation blocking the healthy development of competition among wireless providers holding Lower 700 MHz licenses has become increasingly urgent. Both Verizon Wireless ("Verizon") and AT&T have deployed 4G LTE technologies in a number of markets and both are aggressively expanding their existing 4G LTE coverage while other carriers

[3] *See Application of AT&T Inc. and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations*, Order, 26 FCC Rcd 17589, 17612-18 (2011) ("*AT&T-Qualcomm Order*").

[4] *See Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operation on All Paired Commercial 700 MHz Frequency Blocks*, 700 MHz Block A Good Faith Purchasers Alliance (filed Sept. 29, 2009) ("Alliance Petition").

holding Lower 700 MHz licenses remain stymied or greatly hobbled in their own efforts to deploy these advanced technologies.

According to its March 12, 2012 press release,[5] AT&T is currently serving 28 markets with network infrastructure and mobile devices deployed on Lower 700 MHz B and C Block frequencies under the 3GPP Band 17 subset of the Lower 700 MHz A, B and C Block frequencies comprising 3GPP Band 12. AT&T also is in the process of expanding its 4G LTE service to 12 new markets in the wake of its new 4G iPad launch. Verizon for its part has already entered 258 markets with its LTE offerings as of May 17, 2012 through its upper C Block holdings. While Verizon and Band Class 13 are not directly implicated by this proceeding, carriers who are unable to launch competing LTE offerings as a result of the lack of interoperability are greatly disadvantaged in the marketplace whether they compete with AT&T, Verizon, or both.

In fact, with the exception of the U.S. Cellular/King Street deployment, there has been no comparable deployment of advanced 4G LTE services by Band 12 licensees, including Cavalier Wireless, LLC, Continuum 700 LLC, C-Spire Wireless, Vulcan Wireless LLC and others, despite significant efforts to overcome the lack of a Band 12 device ecosystem. Cox TMI Wireless LLC even was forced to abandon its original plans to launch 4G LTE services. The recent announcement by Verizon that it plans to conduct "an open sale process for all of its 700 MHz A and B spectrum licenses in order to rationalize its spectrum holdings"[6] and the further delay and uncertainty that this portends for the build out and utilization of this spectrum is yet another indication of the need for expeditious action by the Commission in 2012.

[5] http://www.prnewswire.com/news-releases/att-4g-lte-coming-soon-to-cleveland-142280625.html.

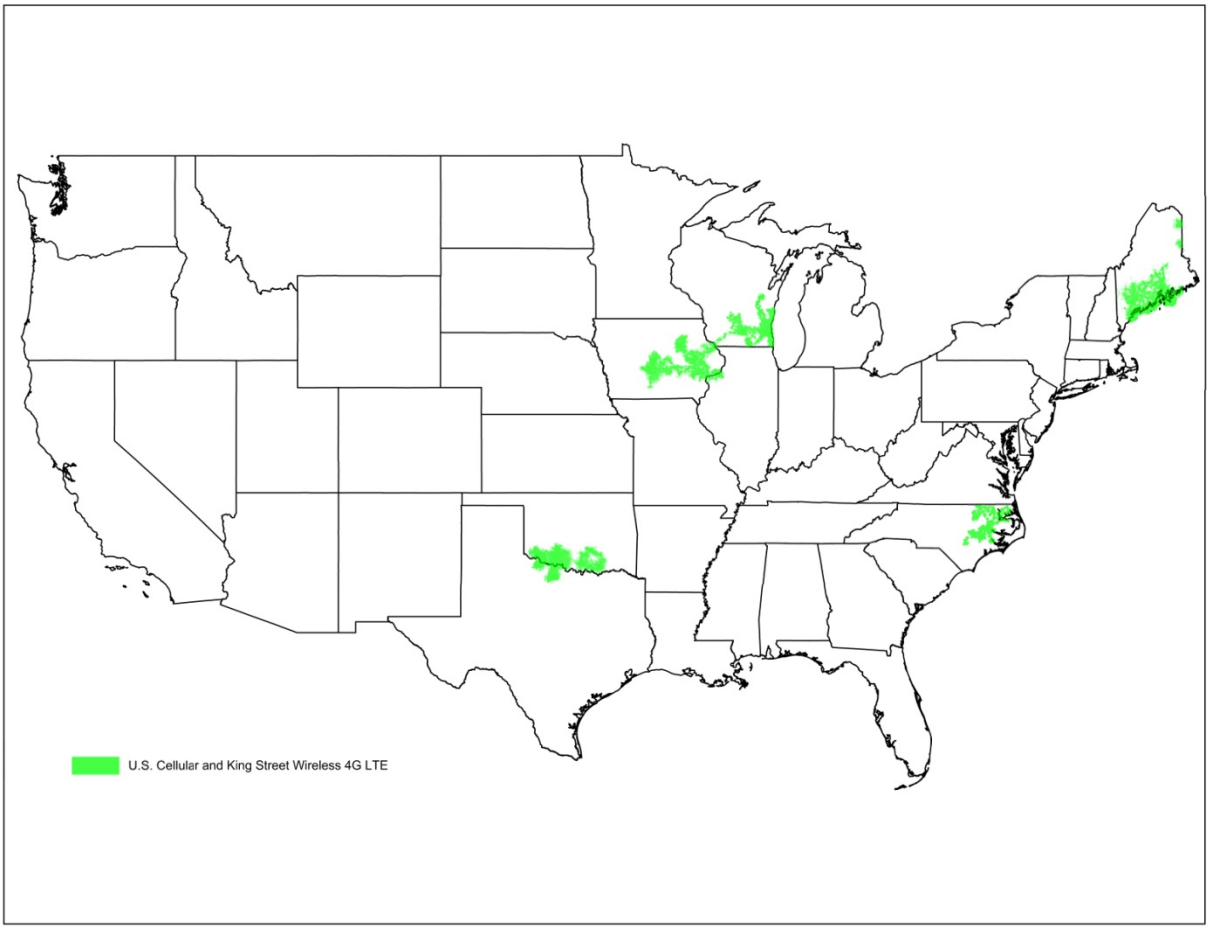
[6] Press Release, *Verizon Wireless to Conduct Spectrum License Sale* (Apr. 18, 2012) ("Press Release") (available at http://news.verizonwireless.com/news/2012/04/pr2012-04-18f.html).

The 2012 launch of 700 MHz 4G LTE service by USCC in conjunction with its partner, King Street Wireless, which is the first and only Band 12 network launch since Lower 700 MHz licenses were awarded in 2009, is the sole exception to this bleak Band 12 deployment picture. But it should not be interpreted as a sign that interoperability requirements are no longer needed. The extended delay that USCC experienced in obtaining access to the first versions of Band 12 chipsets and devices[7] is not competitively sustainable going forward. As shown in the table below, the number of devices and device vendors available to USCC are not comparable to the number and variety available to AT&T and Verizon customers.

Categories	**USCC**	**AT&T**	**VZW**
Device Vendors	1	6	8
Smartphones (# of models)	1	9	11
Tablets (# of models)	1	3	4
Hotspots (# of models)	1	1	4
USB Modem (# of models)	0	1	1

With the 4G LTE capable devices currently available to USCC, it can offer 4G LTE services only in the regional service areas shown in the following coverage map, and its customers currently cannot roam on AT&T's or Verizon's LTE networks. Nor can USCC provide reciprocal roaming to similar carriers due to the device limitations.

[7] *See* Declaration of James R. Anetsberger, Senior Director of Sales Operations and Supply Chain, United States Cellular Corporation, attached hereto.



USCC agrees with and confirms in these comments the statement in the NPRM that adoption of interoperability requirements "would promote key public interest objectives, including competition and consumer choice among mobile broadband service providers, the widespread deployment of 4G networks, particularly in rural and unserved areas, the availability of additional innovative 4G devices, and increased roaming opportunities."[8]

[8] NPRM at ¶ 50.

DISCUSSION

I. THE COMMISSION SHOULD CONCLUDE THAT CLAIMS REGARDING HARMFUL INTERFERENCE TO LOWER 700 MHZ B AND C BLOCK LICENSEES ARE NOT SUPPORTED BY THE RECORD AND ARE NOT AN OBSTACLE TO REQUIRING INTEROPERABILITY.

The Commission requests comment on two primary interference concerns for providers operating in the Lower 700 MHz B and C Blocks: (1) reverse intermodulation interference from adjacent DTV Channel 51 operations; and (2) blocking interference from neighboring high-powered operations in the Lower 700 MHz E Block.[9] As discussed below, USCC does not believe that either of these concerns are supported by the scientific evidence in the record and therefore should not preclude or delay prompt adoption of an interoperability requirement for Lower 700 MHz spectrum in this proceeding.

In response to the Commission's request for comment on possible reverse intermodulation interference from adjacent DTV Channel 51 operations into Lower 700 MHz B and C Block operations, USCC believes the Atlanta Study[10] presents persuasive measurement and quantitative analysis demonstrating that these speculative interference risks are not a reasonable obstacle to interoperability. The Atlanta Study reviewed four possible reverse intermodulation interference scenarios that might affect whether a mobile device with the capability to tune to the Lower 700 MHz A, B and C Block frequencies would experience device transmission mixing with Channel 51 signals. In three of the four scenarios, there were no resulting products that fall within the lowest portion of the B Block device receive block, as illustrated in Table 5.1 (excerpted from the Atlanta Study).[11] In other words, there were no reverse intermodulation interference risks. The only scenario where any measurable impact was

[9] *See id.* at ¶ 32.

[10] *See* Lower 7000 MHz Test Report: Laboratory and Field Testing of LTE Performance Near Lower E Block and Channel 51 Broadcast Stations (Apr. 11, 2012) (filed in WT Docket No. 12-69 on May 29, 2012) ("Atlanta Study").

[11] *See id.* at 47.

found was a Lower B+C Block device transmission combination mixing with Channel 51, but that combination affected a maximum of 0.5 MHz of spectrum, which represents only 5.6% of the 9 MHz of available LTE transmission bandwidth.[12]

Channel 51 DTV Tx (MHz)	Scenario	Lower 700 MHz UE Tx (MHz)	Intermodulation Products (MHz)	LTE UE Rx Block (MHz)	Impact UE Receive?	% RBs Affected
692-698	Lower A Block	A (699.25-703.75)	700.5-715.5	729.25-733.75	No	0%
692-698	Lower B Block	B (704.75-709.25)	711.5-726.5	734.75-739.25	No	0%
692-698	Lower C Block	C (710.25-714.75)	722.5-737.5	740.25-744.75	No	0%
692-698	Lower B+C Block	B+C (704.5-713.5)	711-735	734.5-743.5	0.5 MHz	5.6%

Table 5.1: Channel 51-Lower 700 MHz UE Intermodulation Products

In other words, the Atlanta Study found that the circumstances where interference might occur would be extremely rare. In order to experience Channel 51 reverse intermodulation interference based on the Lower B+C Block device transmission combination, a mobile device would have to be in very weak receive signal conditions (*i.e.*, at Base Station cell edge), be assigned the three lowest resource blocks on the downlink, and simultaneously be assigned the highest resource blocks on the uplink (at full UE transmit power of +23 dBm). Moreover, for users to be affected, they would have to be located in close proximity to a high-power Channel 51 broadcast transmitter. Even in this limited circumstance, the Channel 51 reverse intermodulation interference has the potential to affect only three of 50 resource blocks on the downlink (UE Receiver) for a worst case 6% degradation of service to that user (assuming it is assigned all 50 resource blocks on the downlink).

Based on the Atlanta Study findings, the Commission should reasonably conclude that the risk of B+C intermodulation interference is not meaningful from a provider or user perspective. Degradation, if any, would not be noticeable to a user except in unique and rare

[12] The Atlanta Study assumed in its evaluation of the Lower B+C Scenario that this B+C Block spectrum was owned and operated by the same wireless carrier on a combined 10 MHz LTE network deployment.

circumstances. And, even in worst case situations, users should experience only slight degradation of throughput and would still have viable service capability. In other words, concerns about managing and mitigating the possible reverse intermodulation interference from adjacent DTV Channel 51 operations have now been shown to be overblown and without substance.

II. DUE TO THE COMPETITIVE HARM BEING CAUSED BY BAND CLASS 17, THE COMMISSION SHOULD REQUIRE THAT ANY MOBILE DEVICE DESIGNED TO OPERATE ON LOWER 700 MHZ A, B OR C BLOCK SPECTRUM BE REQUIRED TO TUNE TO ALL OF THESE BANDS AND SUPPORT BAND 12 AS DEFINED IN 3GPP STANDARDS.

The Commission asks for comment on "whether there is likely to be a timely industry solution to interoperability in the Lower 700 MHz band, or whether additional regulatory measures will be necessary to promote interoperability across the Lower 700 MHz band."[13] If there were to be a "timely industry solution," it would have occurred already.

In September 2009, the Alliance warned the Commission that various public interest harms would arise if it failed to prohibit AT&T from adopting restrictive device practices – namely, deploying Band Class 17-only handsets, which cannot operate in the Lower A Block. The Alliance's proposed rulemaking garnered widespread support from 700 MHz licensees, trade associations, public interest groups, and public safety organizations.[14] Unfortunately, during the more than 2.5 years since the Alliance asked the Commission to "immediately initiate a rulemaking to assure that consumers have reasonable access to all paired commercial 700 MHz frequency blocks,"[15] many, if not all, of the predicted public interest harms have become reality. With every passing day carriers desirous of providing their customers with advance LTE-enabled services fall father behind. The Commission therefore must move quickly in requiring

[13] NPRM at ¶ 47.

[14] *See id.* at ¶ 12.

[15] *See* Alliance Petition at i.

interoperability in the Lower 700 MHz bands so these harms are not further exacerbated and before the damage to the competitive marketplace becomes irreversible.

The acquisition by AT&T via commercial transactions of significant 700 MHz commercial paired spectrum holdings, coupled with its decision to deploy single 700 MHz band class devices rather than support parallel development of a 700 MHz broadband device ecosystem for Band Class 12, has severely impeded the competitive roll out of 4G broadband coverage by Lower A Block licensees, and thereby further disadvantaged these small and mid-tier carriers.[16] It also has slowed consumer adoption of broadband in the many parts of the U.S. not served by AT&T and has reduced options for consumers to choose from a diversity of service providers based on features, price, and service quality. These harms, all of which the Commission has sought to address in the past through appropriately-tailored regulations, will continue to increase until the Commission requires interoperability throughout the Lower 700 MHz A, B and C Blocks.

The fact that Verizon, the largest national provider of mobile wireless services (and the earliest adopter of 4G LTE technologies) is no longer planning to deploy its massive Lower 700 MHz A and B Block spectrum holdings[17] means that Verizon can no longer be considered a potential driver of Band Class 12 device development. It is also uncertain whether any purchaser of Verizon spectrum would have sufficient scale and purchasing power to drive the development of a Band Class 12 device ecosystem.

It also means that there is likely to be a significant period when there is no deployment on this Verizon-owned spectrum pending its sale to successor licensees. The only foreseeable

[16] *See* Comments of MetroPCS Communications, Inc., RM-11592, p. 12 (Mar. 31, 2010) ("If customers of non-nationwide 700 MHz licensees will not have the ability to roam on Verizon and AT&T's networks, data roaming for 4G services will be substantially inhibited. Many roaming customers will be left with only 3G services. This will allow the national carriers to tout their 4G services and further limit effective competition from new entrants as well as small, rural and mid-tier carriers.").

[17] *See* Letter of John T. Scott III, Vice President and Deputy General Counsel, Verizon, p. 7 (Dec. 18, 2009).

recourse for other Lower 700 MHz Band Class 12 licensees, and possibly even for purchasers of Verizon spectrum, will be to rely on AT&T to support Band Class 12 device development through interoperability and possibly to furnish badly needed 4G LTE roaming options on its Band 17 networks. With Verizon now prepared to sell all of its massive Lower 700 MHz A and B Block spectrum holdings, the only remaining Lower 700 MHz licensee with the buying power to drive device development in this band is AT&T. In these circumstances, the other smaller licensees understandably need the clarity, consistency, and continuing commitment to mobile interoperability brought by a Commission requirement.

Although the Commission would prefer an industry solution to the current lack of interoperability in the Lower 700 MHz band,[18] no industry solution has been forthcoming since this issue was flagged over 2½ years ago. As a consequence, Commission action is necessary.[19] In contrast to PCS, where the FCC declined to require equipment interoperability, no similar market-based incentives to sell multi-band/multi-block handsets exist with respect to the Lower 700 MHz bands. Because AT&T is licensed for Lower B and C Block 700 MHz spectrum, it does not "have the same incentives to sell devices that operate on more than [its] own portion of the 700 MHz spectrum."[20] In addition, more than 2.5 years have passed since the Alliance filed its petition, during which time AT&T has continued to resist all proposals to offer mobile units

[18] *See* NPRM at ¶ 49.

[19] Comments of MetroPCS at 2; *see* Comments of Cox Wireless, RM-11592, p. 4 (Mar. 31, 2010) ("Cox generally opposes regulatory intervention where market forces can achieve desired results. Nevertheless, the adoption of pro-competitive rules in this instance is required.").

[20] Comments of Cox at 4 (noting that "[c]arriers in the relatively recent past had market-based incentives to sell multi-band/multi-block handsets because their own spectrum holdings were not necessarily contained in a single spectrum band or channel block – they needed multi-band capabilities to access base stations within their own networks.").

with Band Class 12 capabilities.[21] In other words, AT&T already has "fail[ed] to move timely toward interoperability," so additional regulatory steps are appropriate.[22]

Such a regulatory requirement would be consistent with the Commission's "longstanding interest in promoting the interoperability of mobile user equipment in a variety of contexts as a means to promote the widest possible deployment of mobile services, ensure the most efficient use of spectrum, and protect and promote competition."[23] For instance, "[b]eginning with the licensing of cellular spectrum, the Commission has opined that consumer equipment should be capable of operating over the entire range of cellular spectrum as a means to 'ensure full coverage in all markets and compatibility on a nationwide basis.'"[24] Similarly, although market conditions made a PCS interoperability requirement unnecessary, in that proceeding,[25] the Commission again emphasized the importance of interoperability, finding that it would "deliver benefits to consumers and help achieve [the Commission's] objectives of universality,

[21] *See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, Second Report and Order, 22 FCC Rcd 15289, 15362 (2007) ("*700 MHz Second R&O*") (noting that the Commission regulates "when market driven forces alone may not achieve broader social goals."); *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Service*, Second Report and Order, 26 FCC Rcd 5411, 5485 (2011) ("*Data Roaming Order*") (Statement of Commr. Clyburn) ("The fact that these merged companies oppose a mobile broadband service roaming rule suggests to me that they might use their increased market power to unreasonably restrict consumer access to competitive alternatives. … That strategy may serve their companies' interests. But … these roaming restrictions do not serve the public interest.").

[22] *See* NPRM at ¶ 49; *Data Roaming Order*, 26 FCC Rcd at 5480 (Statement of Chairman Martin) ("From both a policy and legal perspective, standing idle in the face of this record would amount to shirking our responsibility.").

[23] NPRM at n. 5.

[24] *Id.* at ¶ 17 (quoting *Inquiry Into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems*, Report & Order, 86 FCC 2d 469, 482 (1981)).

[25] The FCC's approach to auctioning PCS spectrum (*e.g.*, without large regional blocks or package bidding), coupled with the lower level of market concentration which prevailed at the time, ensured that all PCS licensees would work together to build a common ecosystem. Today's circumstances are markedly different.

competitive delivery of PCS, that includes the ability of consumers to switch between PCS systems at low cost, and competitive markets for PCS equipment."[26]

Interoperability in the Lower 700 MHz bands is especially important because "a significant number of Lower A Block licenses are held by smaller, rural, and regional licensees"[27] and because "most areas without mobile broadband coverage are in rural or remote areas."[28] The 700 MHz bands, including the Lower 700 MHz A Block, provide the best opportunity to address this lack of rural broadband coverage because "the excellent propagation characteristics of the spectrum in the 700 MHz Band [ ] enables broader coverage at lower costs."[29] In other words, this spectrum provides a unique opportunity to "promote the provision of innovative services to consumers through the license areas, including in rural areas."[30] Thus, as it has done in the past, the Commission must strive to adopt spectrum policies, including required interoperability, in order to benefit consumers in unserved and underserved rural areas.[31]

Because of the Lower 700 MHz bands' excellent propagation characteristics, the Commission created a mix of geographic licensing areas as a "means of providing increased access to spectrum, *especially in rural areas*."[32] It also imposed more stringent build-out

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[26] *Amendment of the Commission's Rules to Establish New Personal Communications Services*, Memorandum Opinion and Order, 9 FCC Rcd 4957, 5021-22 (1994) ("*1994 PCS Order*").

[27] NPRM at ¶ 22.

[28] FCC, *Connecting America: The National Broadband* Plan, p. 22 (Mar. 2010) ("*National Broadband Plan*").

[29] *700 MHz Second R&O*, 22 FCC Rcd at 15348; *see id.* ("The unique propagation characteristics of this spectrum means that fewer towers will be needed to serve a given license area, as compared to providing service at higher frequencies, and thus large license areas may be served at lower infrastructure costs.").

[30] *Id.*

[31] *See, e.g.*, *id.* at 15362 ("Rapid deployment and ubiquitous availability of broadband services across the country are among the Commission's most critical policy objectives."); Comments of MetroPCS at 13 ("Without Commission action, the beneficial competition that the Commission hoped to spur by licensing the Lower 700 MHz Band will be completely frustrated.").

[32] *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8064, 8083 (2007) ("*700 MHz R&O*") (emphasis added); *see id.* ("These

requirements "[i]n order to better promote access to spectrum and the provision of service, *especially in rural areas*…"[33] Unfortunately, AT&T's deployment of Band Class 17, which was done ostensibly for technical reasons that have now been thoroughly debunked, continues to threaten "to derail the Commission's goal of encouraging use of the Lower A Block by small rural and regional carriers to bring mobile broadband to unserved and underserved rural areas."[34] Current market conditions demonstrate the harm being caused by the continuing use of Band Class 17. For instance, although AT&T has launched LTE service using its Lower 700 MHz B and C Block licenses in 28 markets,[35] USCC, in partnership with King Street Wireless, is the only operator that has begun to launch an LTE network using Lower A Block spectrum, and that launch occurred with a suboptimal number of LTE devices available.

Clearly, AT&T's adoption of Band Class 17 has stranded the investments of many small, rural, and mid-sized 700 MHz licensees.[36] Lower A Block bidders "acquired 700 MHz licenses – thereby agreeing to stringent build-out requirements – in the good faith belief that the 700 MHz band would conform to the traditional model of full interoperability."[37] In other words, "a principal factor that set the value of the spectrum was the assumption that affordable mobile devices would be available for use in the Lower A Block."[38] As a consequence, "[i]f smaller A

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revisions will advance the Commission's statutorily directed goals to promote service to rural areas, promote investment in and the rapid deployment of new technologies and services, avoid the excessive concentration of licenses, and provide for the dissemination of licenses among a wide variety of applicants.") (internal citations omitted); *see* Comments of Rural Cellular Association ("RCA"), RM-11592, p. 8 (Mar. 31, 2010) ("The configuration of the Lower A Block encouraged small rural and regional wireless carriers, such as members of the Alliance, to bid for and acquire Lower A Block licenses, with the intent of using the spectrum to deploy mobile broadband in rural areas.").

[33] *700 MHz Second R&O*, 22 FCC Rcd at 15348 (emphasis added).

[34] Comments of RCA at 7; *see 700 MHz R&O*, 22 FCC Rcd at 8084 ("Smaller and rural operators also should have access to the benefits afforded by the higher power limits in the Lower 700 MHz Band.").

[35] *See* NPRM at ¶ 31.

[36] *See* Comments of MetroPCS at 4.

[37] *Id.* at 12-13.

[38] Comments of RCA at 9.

Block licensees are unable to acquire equipment, then their spectrum may lay fallow for a long period of time."[39]

In addition to encouraging the build-out of Lower A Block networks in rural areas, device interoperability would lead to various other public interest benefits. For instance, Band Class 12 carriers, and in turn their customers, "will be forced to pay higher prices for handsets due to a lack of volume production and the resulting loss of beneficial economies of scale."[40] Because of this lack of affordable mobile devices, "the ability of these carriers to invest in the construction and deployment of mobile broadband infrastructure is now being placed in jeopardy."[41] Moreover, the lack of affordable handsets "will not only disadvantage smaller carriers, but also will seriously disadvantage lower-income consumers,"[42] another demographic group that lags in broadband adoption.[43]

AT&T's size makes it a preferred customer of equipment manufacturers, which has allowed it to obtain a large variety of Band Class 17 devices to offer its customers.[44] In contrast, collectively the Lower A Block licensees currently have only one smartphone available in the marketplace. So long as this imbalance continues, the competitive disadvantage already faced by Lower A Block carriers will increase because "handsets play[] an increasingly important role for

[39] Comments of Triad 700, LLC, RM-11592, p. 3 (Mar. 31, 2010); *see id.* at 10 ("If the proposed … equipment restrictions are allowed to continue, there certainly will be decreased build-out in rural and underserved areas.").

[40] Comments of MetroPCS at 6; *see* Comments of Triad at 10 ("Small, rural, and regional carriers … will be unable to take advantage of economies of scale, as they will be ordering devices with different technical specifications than those of AT&T"); *1994 PCS Order*, 9 FCC Rcd at 5022 ("[B]road interoperability will increase economies of scale…").

[41] Comments of RCA at 10; *see* Alliance Petition at 5 ("Without Commission action that assures inclusion of Block A spectrum in mobile equipment there will be no affordable mobile equipment useful for that spectrum and no business case for Block A licensees to invest in facilities to serve the rural areas.").

[42] Comments of MetroPCS at 6.

[43] *See National Broadband Plan* at 5 ("While broadband adoption has grown steadily, it is still far from universal. It lags considerably among certain demographic groups, including the poor, the elderly, some racial and ethnic minorities, those who live in rural areas and those with disabilities.").

[44] *See* Alliance Petition at 4 (noting that only the "two largest carriers will get early access to equipment").

consumers as a basis for choosing providers."[45] In fact, "a recent report from Consumers Union … suggests that many consumers switched to new wireless service providers in order to obtain a particular handset."[46] Thus, Lower A Block licensees' inability to secure a variety of handsets has granted AT&T a significant "head-start" advantage, which will allow AT&T "to further cement [its] dominant market position by enabling [it] to offer unique services and products that other carriers using 700 MHz will not be able to offer."[47] As the Commission has recognized, a "'head-start' advantage can constitute a significant hurdle to new competition."[48] For instance, "[i]f consumers are unable to purchase 700 MHz equipment from small, rural, and mid-tier carriers when service in the 700 MHz band becomes available, they will immediately turn to the largest carriers due to the capacity and propagation benefits that 700 MHz will provide."[49]

The lack of device interoperability across the 700 MHz band also severely limits essential roaming options for Lower A Block licensees. As the Commission recently concluded, the benefits of a "data roaming obligation are substantial."[50] For instance, "[d]ata roaming will encourage service providers to invest in and upgrade their networks and to deploy advanced mobile services ubiquitously, *including in rural areas*."[51] This increased competition directly

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[45] *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, Fourteenth Report, 25 FCC Rcd 11407, 11583 (2010).

[46] *Id.*

[47] Comments of MetroPCS at 6; *see* Comments of USCC, RM-11592, p. 7 (Mar. 31, 2010) (noting that the lack of Class 12 devices guarantees AT&T a head start advantage and "assure[s] carryover of [its] market share dominance into 4G wireless broadband while [it]s competitors are compelled to wait on the sidelines for the development of devices.").

[48] *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Service*, Order on Reconsideration and Second Further Notice of Proposed Rulemaking, 25 FCC Rcd 4181, 4192 (2010) ("*Roaming Recon Order*"); *see Interconnection and Resale Obligations Pertaining to Commercial Mobile Radio Services*, First Report and Order, 11 FCC Rcd 18455, 18465 (1996) ("*Interconnection Order*") ("The advantages such incumbency conveys are well understood.").

[49] Comments of MetroPCS at 10.

[50] *Data Roaming Order*, 26 FCC Rcd at 5427.

[51] *Id.* at 5443 (emphasis added).

advances the public interest because it leads to lower prices and greater utilization of broadband data services.[52]

In addition to greatly benefitting consumers, the ability of Lower A Block licensees, many of which are smaller, rural, and regional carriers, to enter into data roaming arrangements is essential because these licensees "are dependent upon roaming agreements for the provision of seamless communications."[53] Without the ability to offer their customers broad roaming capabilities, these carriers will be prevented from becoming viable competitors to AT&T and other nationwide carriers.[54] Moreover, because "most areas without mobile broadband coverage are in rural or remote areas,"[55] the ability of Lower A Block licensees to offer ubiquitous mobile broadband services is crucial to ensuring that all Americans have broadband access.[56] Not only will the inability to offer broad roaming capabilities make it more difficult for A Block licensees to attract customers,[57] but there "will be a loss of roaming service revenue that has severe

[52] *See id.* at 5428 ("[A] rough estimate is that the benefits from the increased competition would be in the billions of dollars per year."); *id.* at 5427 ("[M]illions of American consumers who otherwise might not have full access to mobile broadband services will benefit from adoption of the rule.").

[53] Comments of RCA at 9; *see Data Roaming Order*, 26 FCC Rcd at 5419 ("Providers with local or regional service areas need roaming arrangements to offer nationwide coverage…"); Comments of Triad at 5 ("Customers will not sign on with small carriers who are unable to ensure that customers will be able to roam outside of the smaller carrier's network.").

[54] *See Data Roaming Order*, 26 FCC Rcd at 5419 ("[C]onsumers increasingly expect their providers to offer competitive broadband data services, [so] the availability of data roaming arrangements can be critical to providers remaining competitive in the mobile services marketplace."); *id.* at 5480 (Statement of Chairman Genachowski) ("The evidence shows that mobile providers must be able to offer nationwide voice and data plans to have any chance of competing in today's market.").

[55] *National Broadband Plan* at 22.

[56] *See Data Roaming Order*, 26 FCC Rcd at 5426 ("We note again the importance of roaming to consumers in rural areas, where mobile data services may be solely available from small rural providers…"); *id.* at 5480 (Statement of Chairman Genachowski) ("[T]he the absence of data roaming guarantees will limit our broadband future by eliminating choices, especially in rural areas, or in some cases delaying or preventing access to mobile broadband at all.") (emphasis added); *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers*, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 15817, 15828 (2007) ("*Roaming Order*") ("[I]t is in the public interest to facilitate reasonable roaming requests by carriers on behalf of wireless customers, particularly in rural areas.") (emphasis added).

[57] *See* Comments of MetroPCS at 13 ("Customers will not be attracted to non-nationwide carriers who are unable to promise that end users will be able to roam on the networks of other carriers when they travel."); Alliance Petition at

competition implications and will impact greatly their ability to construct systems in rural areas."[58]

By not supporting Band Class 12 handsets, the recent data roaming goals of the Commission have been seriously compromised.[59] As MetroPCS pointed out to the Commission more than two years ago, "[w]ithout the availability of compatible devices, a requirement that carriers provide data roaming will be a hollow one."[60] This is exactly the situation Lower A Block licensees now face. Accordingly, because AT&T is capable of providing interoperable handsets, the Commission should not permit it to evade the spirit of the roaming mandates by engaging in restrictive device practices.[61] Rather, the Commission should immediately adopt a Lower 700 MHz interoperability requirement, because only then will AT&T's network become a viable roaming option for A Block licensees. Without an interoperability requirement, smaller carriers' current inability to offer broad roaming will continue to increase AT&T's already significant "head-start" advantage, which "will deter investment and constitute a significant hurdle to competition."[62]

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6 ("Competing carriers … will not be able to offer their customers an ability to roam broadly, and thus, will now be able to compete effectively for customers.").

[58] Alliance Petition at 4; *see* Comments Triad at 6; Comments of MetroPCS at 13.

[59] *See* Comments of MetroPCS at 12 ("These worthy [roaming] goals will be completely undermined if 700 MHz equipment develops in a fashion that makes intercarrier roaming technically infeasible.").

[60] *Id.*; *see id.* ("The ultimate result will be to keep non-nationwide competitors from attracting the customers and earning the revenue that they will need to survive and to buildout the systems that are necessary to foster broadband dissemination and adoption to rural households.").

[61] *See Roaming Order*, 22 FCC Rcd at 15885 (Statement of Commr. Copps Approving in Part, Concurring in Part) ("[Consumers] should be able to assume that their phones will work to the fullest extent that technology permits, wherever they happen to be."); Comments of Cox at 5 ("AT&T should not be able to evade roaming requirements by deploying handsets that are limited to the spectrum for which [it is] licensed.").

[62] *Roaming Recon Order*, 25 FCC Rcd at 4198 (rejecting "AT&T's argument that there is no evidence to suggest that home roaming is necessary to eliminate the 'head start' advantage of larger carriers."); *see Data Roaming Order*, 26 FCC Rcd at 5421 ("[L]acknowledge of roaming can constitute a significant hurdle to new competition…"); *Interconnection Order*, 11 FCC Rcd at 18466 ("[T]he earliest licensed broadband PCS providers will have a headstart advantage… [T]he ability to resell their competitors' services will help lower this hurdle for the later PCS entrants and give them the opportunity quickly to become viable competitors.").

In summary, USCC urges the Commission to adopt a rule to require that no later than 12 months from the date of an order or the end of 2013, whichever is earlier, all mobile devices designed to operate on any Lower 700 MHz A, B or C Block mobile transmit spectrum must tune to all Lower 700 MHz A, B and C Block mobile transmit frequencies and incorporate mobile device architecture supporting Band Class 12 as defined in 3GPP standards. USCC believes that a twelve month window is more than sufficient for AT&T to exhaust its existing inventory of Band Class 17 devices and to develop new Band Class 12 inventory.

III. ALTHOUGH A RECENT TEST STUDY ALSO CONFIRMS THAT THERE IS NEGLIGIBLE, IF ANY, POTENTIAL FOR HIGH-POWER/HIGH-SITE LOWER 700 MHZ E BLOCK OPERATIONS CAUSING RECEIVER OVERLOAD IN BAND 12 DEVICES OPERATING IN THE LOWER 700 MHZ B AND C BLOCKS, USCC STILL SUPPORTS ADOPTION OF MODIFIED LOWER 700 MHZ E BLOCK POWER/ANTENNA HEIGHT REQUIREMENTS.

The Atlanta Study confirmed that there is negligible, if any, potential for high-power/high-site Lower 700 MHz E Block operations causing receiver overload to Lower 700 MHz B and C Block operations as claimed by AT&T as a "primary concern."[63] The Atlanta Study also concludes that, in the event the Commission requires Lower 700 MHz interoperability, the implementation of Lower 700 MHz A Block spectrum in devices would not disrupt or interfere with a Band Class 17 network in the Lower 700 MHz B or C Blocks. Nor would such implementation disrupt or interfere with the use of Lower 700 MHz B and C Block spectrum in the event AT&T were to implement Band Class 12 network operations in specific markets.[64]

While Lower 700 MHz B and C Block operations would not be disrupted, high-power/high-site Lower 700 MHz E Block operations have the potential to interfere with adjacent

[63] *See* Letter of Joseph P. Marx, Assistant Vice-President, Federal Regulatory, AT&T, RM-11626, RM-11592 (Feb. 28, 2012).

[64] *See* Atlanta Study, pp. 19-42

channel Lower 700 MHz A Block operations. The Atlanta Study shows that in a Lower A Block deployment, the Lower A Block frequency spacing is closer to the Lower E Block than the spacings for the Lower B and C Blocks. This reduced separation results in reduced Lower A Block device selectivity creating opportunities for blocking interference by Lower E Block signals. The Atlanta Study discusses how the susceptibility of Lower A Block devices to blocking interference from Lower E Block operations can be mitigated by the reduction in Lower 700 MHz E Block ERP.[65]

USCC reiterates its previous request[66] for the Commission to modify its rules for Lower 700 MHz D and E Block operations, consistent with the parameters set forth in the AT&T/Qualcomm Order, to address potential harmful interference to Band Class 12 device operations caused by the Lower E Block licenses that are not held by AT&T. USCC agrees with AT&T that harmonizing frequency uses in Lower D and E Block spectrum to avoid disruption in other Lower 700 MHz blocks, including AT&T's Lower 700 MHz D Block operations, would help unlock the full potential of this spectrum.[67] Specifically, the Commission should require all Lower E Block licensees to operate the six megahertz of Lower 700 MHz E Block spectrum: (i) subject to the same power limits and antenna height restrictions that apply to Lower 700 MHz A and B Block licensees; (ii) consistent with the limits set forth in Section 27.50(c), excluding Subsection 27.50(c)(7); and (iii) subject to downlink only transmission and other interference mitigation restrictions imposed under the Commission's AT&T-Qualcomm Order.

In its AT&T-Qualcomm Order, the Commission already recognized the public interest benefits obtained by limiting the potential for harmful interference and disruption to existing and

[65] *See id.* at 25-27, 36 & 41.

[66] *See* Letter of George Y. Wheeler, Holland & Knight LLP, IB Docket No. 11-149 (Feb. 2, 2012).

[67] See Letter of Joan Marsh, Vice President, Federal Regulatory, AT&T, IB Docket No. 11-149, p. 6 (Feb. 17, 2012).

planned Lower 700 MHz operations from high-power operations in the D and E Block spectrum. Extending these benefits to include the remaining E Block licenses held by Manifest Wireless and others would complete this harmonization of the power, height, and other operating parameters for the Lower 700 MHz band and would create a level playing field for all services in the Lower 700 MHz spectrum.

IV. AFTER ADOPTING AN INTEROPERABILITY REQUIREMENT, THE COMMISSION SHOULD CONTINUE TO FACILITATE AND MONITOR THE PROGRESS OF INDUSTRY STAKEHOLDERS TO ENSURE TIMELY COMPLIANCE.

USCC agrees with the Commission's observation that, if the industry fails to move timely toward interoperability "additional regulatory steps might be appropriate to further the public interest."[68] Adopting the interoperability requirement, as proposed above, is only the first step in the implementation process. The Commission must remain engaged so that if additional regulatory steps might be appropriate they can be initiated in a timely manner.

USCC also proposes that the Commission "remain vigilant in monitoring the state of interoperability in the Lower 700 MHz band to ensure that the industry is making sufficient progress"[69] by requiring that all Lower 700 MHz A, B and C Block industry stakeholders, including Lower 700 MHz A, B and C Block licensees and device manufacturers (specifically those holding equipment certifications for devices designed to operate on Lower 700 MHz A, B and C Block spectrum), file quarterly reports in this proceeding describing the steps they have taken to comply with the Commission's interoperability requirement. These reports should cover licensee and device manufacturer efforts to establish compliance including: (1) any efforts to support interoperability within their devices; (2) descriptions of their products that specifically support Band Class 12; and (3) any instances where supporting an interoperability requirement

[68] NPRM at ¶ 49.

[69] *Id.*

resulted in measurable interference, and, if so, how that interference was resolved. These periodic submissions would allow the Commission to monitor progress and, in the event additional Commission action is required, to facilitate timely compliance with its interoperability goals.

V. THE COMMISSION SHOULD ACT EXPEDITIOUSLY TO CLEAR CHANNEL 51 BROADCAST OPERATIONS IN AN EFFORT TO FOSTER ADDITIONAL A BLOCK DEPLOYMENTS.

CTIA has urged the Commission to work to expeditiously clear Channel 51 operations.[70] USCC has previously urged the Commission to likewise make this effort a priority.[71] While Channel 51 interference with the A Block has no bearing on the interoperability issue that is central to this proceeding, it is an issue of great importance to A Block license holders and needs to be addressed. Therefore, USCC renews its request again in these comments. Efforts to clear Channel 51 also will further facilitate the development of a robust handset ecosystem and a robust roaming ecosystem by fostering deployment in areas potentially impacted by Channel 51 exclusion zones.

CONCLUSION

The Commission has a unique opportunity to promote competition and consumer choice among mobile broadband service providers, expand 4G LTE coverage, and increase widespread availability of advanced devices by adopting interoperability requirements for the Lower 700 MHz bands. USCC believes its interoperability proposal is a measured but essential first step to jump start Band Class 12 deployment. The proposal can be implemented promptly without disruption, interference, or added costs to incumbent operations. By expanding support for a Band Class 12 device ecosystem, the Commission will remove longstanding barriers to 4G LTE

[70] *See* CTIA – The Wireless Association, *Notice of Ex Parte*, RM-11626, RM-11592 (Feb. 27, 2012).

[71] United States Cellular Corporation, *Notice of Ex Parte*, WT Docket No. 12-69, WT Docket No. 12-4, AU Docket No. 12-25, CC Docket No. 96-45 (May 9, 2012).

deployment and promote expansion of wireless broadband as a platform for innovation and economic growth.

Respectfully submitted,

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June 1, 2012

DECLARATION OF JAMES R. ANETSBERGER
SENIOR DIRECTOR OF SALES OPERATIONS AND SUPPLY CHAIN
UNITED STATES CELLULAR CORPORATION

I, James R. Anetsberger, of lawful age, being duly sworn, depose and state as follows:

1. I currently hold the position of Senior Director of Sales Operations and Supply Chain at United States Cellular Corporation ("USCC"). In this capacity, I am primarily responsible for leading Sales Operations Strategic Initiatives, retail store design and construction, and managing the device and accessory supply chain for USCC. I have been in my current position for seven months. Previously, I held the position of Director of Device Strategy and Management, where my responsibilities included device and accessory strategy, product development, lifecycle management and product support programs. I also led USCC's go-to-market strategy and development for 4G LTE devices.

2. Beginning in early 2010, I was named to a team at USCC tasked with developing and implementing plans for deployment of an LTE network over our existing regional footprint. We intended to develop 4G LTE service offerings using 700 MHz spectrum in conjunction with USCC's partner, King Street Wireless, to support an LTE launch. My specific assignment was to lead the team responsible for device development, which included negotiating with handset manufacturers for devices capable of operating in Band Class 12. On March 22, 2012, USCC commercially launched LTE service to approximately 25% of its footprint. USCC's device portfolio at launch consisted of only one tablet and was followed by one smartphone two weeks later. The purpose of this declaration is to describe the difficulties USCC experienced in obtaining timely and cost effective LTE devices as a result of the lack of development of a Band Class 12 LTE ecosystem caused by the splintering of the lower bands into two distinct band classes.

3. To accommodate the variety of spectrum used within its network, USCC's specifications for LTE devices included the need for such devices to operate in four distinct band classes; Cellular, AWS, PCS and Band Class 12. To our knowledge, USCC is the only carrier in the United States to be able thus far to obtain a Band Class 12 device and its devices represent the first "quad band" LTE device ever manufactured.

4. USCC initially approached nine different handset manufacturers – known in the industry as "Original Equipment Manufacturers" or "OEMs" – beginning in early 2010 about its LTE plans and need for a commitment to a steady stream of access to devices to support its launch and thereafter. USCC's original plans had contemplated access to a variety of 4G LTE devices at launch to satisfy expected customer desire for a choice in devices.

5. During the initial LTE launch planning phase, four of the potential nine vendors indicated interest in potentially providing LTE handsets for USCC's 4G launch. The other five withdrew from consideration because of technical and/or financial challenges of supporting USCC's need for a quad-band device which could operate on Band Class 12. During the next phase of detailed discussions with the remaining four vendors, USCC spent considerable time with each to review

its priorities and plans and to determine whether they had the technical capabilities to support USCC's launch with devices it could afford. This process took many months, during which two more vendors dropped out because of technical and/or financial challenges with the product USCC required.

6. Over the course of the next few months, USCC made significant progress with one of the remaining OEMs, but the other was unable to commit, citing the technical difficulties of developing a quad band device to operate on Band Class 12 in the time that USCC required. At this point, no OEM had ever developed a quad band device for commercial use. USCC was reluctant to launch LTE service with only one handset vendor, so it attempted to find an additional OEM. At this point, USCC had been in active discussions with OEMs to provide it with LTE devices at launch for nine months and still had no contractually binding commitment from any vendor to provide a quad band device for Band Class 12.

7. USCC worked with a potential additional OEM for months on planning and design of a 4G product, but due to the complexity of Band 12 and quad-Band requirements coupled with low volume of device commitments, this OEM decided to terminate the project unless USCC could provide a substantial upfront payment to help underwrite the cost of R&D and to improve the financial justification for the commercial product for the OEM. USCC declined because the product cost was extremely expensive to begin with and additional expenditures could not be justified in light of the relatively small amount of devices a carrier of USCC's size could commission.

8. Throughout the entire planning and design process, USCC conducted over a hundred conference calls and dozens of face-to-face meetings, and communicated practically daily with the OEMs, to help make potential products a reality. One by one each OEM discovered the challenges of product realization within the constraints of technical and financial issues were impossible to overcome in the time frame expected. In most cases, the OEM partner wanted to support USCC in its launch, but could not justify the investment necessary to overcome the complexity of introducing a device with chipset support for Band Class 12 given the limited volume that USCC could commit to.

9. Given the challenges with product realization, including the lack of available product due to complexity and lack of scale to justify large investments in product development, USCC had to adjust its priorities for launch and focus on getting at least one device launched by the initial target date from the sole remaining OEM, Samsung, willing to work with USCC to introduce a device.

10. The devices USCC targeted for launch were a smartphone and a tablet. In addition, two follow-on products, Mobile Hotspot and an additional smartphone, were scheduled for introduction in subsequent months following the initial launch.

11. Despite the best efforts of both Samsung and USCC, the devices were not ready in time for the originally scheduled LTE launch date of October 2011. USCC ultimately launched LTE service on March 22, 2012 for its tablet offering, and for its smartphone two weeks later.

12. The 4G LTE Smartphone USCC launched was 11 months behind comparable product of a large wireless carrier, and other products launched to date have a minimum of 11 months delay relative to comparable product at large competitors. To date, Samsung remains USCC's only OEM partner to commercialize products within the Band 12 device ecosystem.

13. As of today, USCC continues to work with a variety of OEM partners on developing a competitive 4G roadmap for its customers. However, as a result of low unit volume and technology support within the Band 12 ecosystem, USCC is seeing a higher cost of 4G product and is experiencing delays of 10-11 months after comparable product introduction by large wireless competitors. As of today, USCC remains the only carrier operating an LTE network in Band Class 12 and the volumes that it has to leverage for devices going forward are insufficient to substantially add to its suite of devices or produce devices at cost levels that the largest LTE carriers can achieve.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 1, 2012.

James R. Anetsberger

State of Illinois
County of Cook

Sworn to me before a Notary Public
This 1st day of June, 2012

Betty J. Zabrotanski

My commission expires 3/27/15