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

In the Matter of)
)
Implementation of Section 6002(b) of the) WT Docket No. 13-135
Omnibus Budget Reconciliation Act of 1993)
)
Annual Report and Analysis of Competitive)
Market Conditions With Respect to Mobile)
Wireless, including Commercial Mobile)
Services)

Also Re Docket WT 12-69 *Promoting Interoperability in the 700 MHz
Commercial Spectrum*

Reply Comments of Information Age Economics

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The Erosion of Effective Competition Through Non-Interoperability

Summary	2
Introduction.....	3
Non-Interoperability is harmful and unnecessary.....	5
The Egregious Case of Unjustified LTE Non-Interoperability	7
The Unilateral Role of AT&T in Introducing Non-Interoperability.....	10
Conclusion	10
Appendix 1: Non-Interoperability - Selected Evidence and Analyses	12
Appendix 2: Impact of Device Availability on the Value of Frequencies for Small Operators	14

Summary

These Reply Comments demonstrate the erosion and potential elimination of competition in the U.S. mobile broadband market that will be a major consequence of allowing AT&T to continue and to further expand non-interoperability in its LTE (Long Term Evolution) wireless deployments. **There is not, and cannot be, effective competition in the U.S. mobile market as long as non-interoperability between LTE networks is allowed to persist.**

The imminent and ongoing rapid expansion and extension of non-interoperability that is planned by AT&T raises the possibility that non-interoperability will prove to be a pervasive (as well as exceptional on the global stage) characteristic of the U.S. mobile broadband market. This outcome will irreversibly erode competition between operators, as well as between the major operators and third parties that offer services.

This outcome would also reduce the benefits that exploitation of mobile broadband technologies and services can generate for the users of mobile services, i.e., effectively all U.S. residents, as well as entrepreneurial innovators and other non-operators who deliver services and applications over mobile networks, and thereby enhance the vibrancy and progress of the entire U.S. economy. **Furthermore, as the CEO of AT&T has enthusiastically acknowledged and predicted, the repercussions of mobile broadband – and hence of non-interoperability in terms of increased costs, inhibition of competition, and operational implications - will increasingly be felt throughout the U.S. economy.**

The value of mobile broadband networks will become pervasive in U.S. society as growing numbers of devices and products from vehicles to health care monitors to safety and security systems, financial terminals, remote sensors in agriculture etc. become connected wirelessly.

Non-interoperability works solely to the advantage of increasing the profits of AT&T with no concomitant benefits to consumers or others to justify this higher profitability. Decisions about wireless network interoperability that will have an impact on the entire U.S. economy and throughout society must not be left to the discretion of a corporation that moreover is basing its investments in non-interoperability on exploitation of a public resource - spectrum - that has been entrusted to it in exclusive licenses.

Introduction

Non-interoperability is an assault on one of the fundamental, long standing, technology-independent principles that has sustained competition and innovation in the U.S. T-I-E (Telecommunications-Information-Entertainment) ecosystem that has brought enormous benefits to all customers of network services and the U.S. economy for eight decades. Non-interoperability has recently and unilaterally arisen as a result of its introduction by AT&T in the U.S. in its deployment of LTE in the 700 MHz Lower Band following the FCC's Auction 73 of 700 MHz licenses in 2008.

In its strong and sustained advocacy of LTE non-interoperability, AT&T has so far not addressed non-interoperability's integral relationship to the state of competition in the U.S. wireless market in the Comments it has submitted in Docket 13-135. The discussion of interoperability included in Comments filed by other parties have not, in our judgment, delineated the full and profound negative impact that LTE non-interoperability will have on the state of competition in the U.S. wireless market, as the role of LTE in this sector expands and becomes pervasive. One forecast is that LTE subscribers will account for 70% of U.S. mobile connections in 2017.¹

Non-interoperability establishes a mutually exclusive spectrum band for AT&T that enables it to create anti-competitive silos around its customer bases. It requires the development of operator-specific versions of wirelessly-connected devices. In the near future LTE inter-band carrier aggregation will be introduced by AT&T that combines the frequencies it holds within interoperable bands with its non-interoperable band. As a result, the impact of non-interoperability will be felt throughout the LTE ecosystem since the best performance available on devices offered by AT&T that work in interoperable bands will only be achieved in operator-specific devices capable of supporting carrier aggregation between these bands and its non-interoperable band.

As Acting Chairwoman Mignon Clyburn has noted the, "current lack of interoperability, in the lower 700 MHz band, is impeding the deployment of competitive options for consumers."²

There is confusion among some important stakeholders as to the implications, or the basic meaning, of interoperability. For example, in a filing in Docket 12-268

¹ <http://www.fiercewireless.com/story/report-us-lte-subscribers-will-make-70-connections-2017/2013-06-11>

²In the Matter of Expanding Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Statement by Commissioner Mignon L. Clyburn, GN Docket No. 12-268, FCC 12-118 (released October 2, 2012).

(Incentive Auctions) by the Consumer Electronics Association there are two conflicting comments about interoperability as follows³:

1. "For CEA members, rapid coordination will help encourage manufacturers to build new devices – particularly with the potential for a larger market for possible sales, assuming interoperability across borders." (p. 33 of the CEA filing, referring to coordination with Mexico and Canada).
2. "*Promote Innovation.* As the Commission outlines the structure of the incentive auction and the 600 MHz band plan, it should reject calls to mandate interoperability or require certain technologies. Flexible use has a proven track record of promoting innovation, and the Commission should continue that policy." (p. (ii) of the CEA filing).

The first comment reflects the interest of the CEA's members, who are electronics manufacturers, in being able to deliver the same products to as large a market or as many national markets as possible. The second comment reflects the position of AT&T, also a member of the CEA, regarding conditions on the use of spectrum. The CEA finds itself in the awkward position of being simultaneously both for and against interoperability.

This filing is aimed at presenting a comprehensive and clarifying picture of the extent of the current and potential future erosion of competition in the U.S. wireless market that are the consequences of non-interoperability. It also depicts the unilateral initiatives of AT&T in first introducing non-interoperability without any review of its far reaching implications, and then in pursuing its expansion aggressively while resisting attempts to halt non-interoperability before it becomes a permanent, pervasive and unique "feature" of the U.S. mobile market.

Non-interoperability in mobile broadband networks is profoundly harmful to the interests of consumers and competitors. It builds substantial barriers to healthy competition and hampers the ability of innovators and entrepreneurs to deploy and commercialize their services and applications. Non-interoperability between and across networks allows AT&T to exercise increasingly unchallengeable power over the services, applications and prices offered to customers. It enables AT&T to increase switching costs incurred by, and to build other barriers to discourage and inhibit, its customers who may wish to change service providers. Non-interoperability also puts AT&T in the position of a monopsony with respect to negotiating inter-operator agreements such as for international roaming.

In addition non-interoperability has negative implications for wireless-enabled public and private safety and security systems that make use of commercial wireless networks. These systems are more likely to be vulnerable to "single point of failure"

³ Comments of the Consumer Electronics Association,
<http://apps.fcc.gov/ecfs/document/view?id=7022111851>

risks if in some installations they rely on a connection to one non-interoperable network. Alternatively their costs will be increased by having to incorporate the ability to connect to multiple non-interoperable networks to ensure redundancy (back-up) in their connectivity.

In a mobile market in which non-interoperability is widespread, there will be no checks and balances from competitive forces or from regulations⁴ on the actions and behavior of AT&T with respect to the conditions of use of its mobile network, even though this network makes extensive use of public resources from publicly-owned spectrum to rights-of-way. As a consequence the natural tendencies of human beings and their organizations to act in response to the financial and other incentives, rewards and temptations they experience will ensure that AT&T, which controls significant essential facilities (access and backhaul networks), will successfully engineer outcomes in which it is able to favor its own interests. It will be motivated to take actions from which it alone benefits, even at the expense of everyone else, with no restraints on the exercise of its power.

The claims by AT&T that there is effective and even intensifying competition in the U.S. mobile wireless market are and will remain ill-founded as long as non-interoperability persists. These claims will become increasingly implausible if non-interoperability is allowed to expand to the extent that is foreseen in AT&T's plans for investments in additional LTE capacity and coverage, as well as the introduction of new techniques that combine non-interoperable with existing interoperable frequency bands over the next one to five years.

Non-Interoperability is harmful and unnecessary

The harmful consequences of non-interoperability can be seen, in contrast to the benefits and value of interoperability, in many daily human activities. For example, think of the complications if there were multiple standards for electrical appliances so that a particular toaster or vacuum cleaner or coffee grinder could only be plugged into a subset of electrical outlets, or used in only some but not all homes or buildings. Suppose that each debit or credit card required its own non-interoperable point-of-sale terminal so that retailers had to devote significant space and incur other costs to accommodate all of them. Imagine the consequences if various models of TV sets and cable modems worked exclusively in some U.S. geographies, but were non-operable in others⁵. What if there were no standards for Ethernet and

⁴ "Broadband, into which category LTE-based network services fall, is currently categorized as an "information service," which relieves operators from sharing obligations. AT&T argued in favor of this categorization that the FCC established in 2005.

⁵ The cable industry to its credit developed the DOCSIS cable modem standard in the mid-1990s (that like Ethernet has since its origins been upgraded substantially and innovatively in subsequent generations) specifically to avoid the problem of non-interoperability as well

802.11 (Wi-Fi) that facilitate interoperability for the benefit of all users of ICT (Information and Communications Technology) products regardless of their location on the globe or within the U.S. Suppose that different makes and models of cars or aircraft varied with respect to the sizes of the openings in their fuel tanks so any one of them could only be refueled at some gas stations or respectively at some major airports – or gas pumps and tankers had to carry a “Swiss knife-like” assortment of nozzles.

These examples demonstrate the potential effects of continuing to have to offer different versions of LTE-capable iPhones or iPads or Android-based smartphones that, as is the case today, are operator-specific. At best these effects may amount to annoying inconveniences and unnecessary incremental costs for customers. At worst, and more likely, the longer these effects persist they will create substantial barriers to customers’ freedom of choice, and will make non-operator innovators of services and applications, as well as suppliers of wirelessly-connected products, hostage to the tender mercies of AT&T in negotiations about which products, services and applications will come to market, when, and under what conditions. ***Furthermore, the impact of wireless non-interoperability will spread to encompass a growing number of appliances, electronic devices, and other products e.g., sensors, as they become connected wirelessly in the emerging “internet of things”⁶.***

Contrary to the thinking expressed in the second comment quoted above from a CEA filing in FCC Docket 12-268, an FCC requirement for interoperability does not impede innovation. For example, the Ethernet standard that has enabled interoperability for users between broadband networks has improved its performance by orders of magnitude since it was first introduced. The global adoption of this standard has stimulated the commercialization of a plethora of innovative services and applications whose developers knew they could address national and global markets, provided they were compatible with Ethernet.

In contrast, “flexible use,” as advocated in the CEA filing, can be manipulated to introduce proprietary, non-interoperable network interfaces that create silos around customers and inhibit the spread of innovations by increasing their costs to accommodate connections to multiple networks over multiple interfaces. The philosophy inherent in this comment, and in the identical position expressed by AT&T, is antithetical to the value of the network effect – that higher usage of a product or service makes it more valuable – that both these operators publicly espouse except in the context of LTE non-interoperability.

as to gain the benefits of economies of scale in product costs and strengthen cable companies’ negotiating positions with equipment vendors.

⁶ See for example, “The Internet of Things,”

http://www.mckinsey.com/insights/high_tech_telecoms_internet/the_internet_of_things;

“Internet of Things Propels the Networked Society,”

<http://labs.ericsson.com/blog/internet-of-things-propels-the-networked-society>

Our everyday lives would be more frustrating and expensive, and the economic and social lives of the nation less productive and less satisfying, unless interoperability had been established and enforced in the examples cited above, which it has not yet been for LTE networks. Interoperability has been achieved and maintained, thanks to various mixes of complementary commercial forces, and where necessary regulations,⁷ that combined to produce a commonsense solution in the best interests of both competition and consumers.

The Egregious Case of Unjustified LTE Non-Interoperability

In the case of non-interoperable mobile broadband networks the harm caused by non-interoperability is particularly egregious and unjustified since it is being implemented through the exploitation of publicly owned resources (spectrum) by a private company for its own profit. The use of public property that has been entrusted through exclusive licenses to AT&T to create value from which it benefits is legitimate and desirable. Yet the use of this public property to inflict harm on, deny, or impair significant unmistakable potential benefits to the public is not permitted or tolerated.

AT&T justifies its introduction of non-interoperability on the grounds that otherwise it is not possible, because of interference issues, to create value from utilization of this spectrum. The bases of the evidence and arguments AT&T has brought forth to support this assertion have been demolished in multiple filings to the FCC in Docket 12-69 as well as in other analyses. Selected examples of the extensive body of evidence and research debunking the need for non-interoperability, and delineating the harm it is causing, as well as the costs that would be incurred to achieve interoperability within the 700 MHz Lower Band, are presented in Appendix 1.

The history of the introduction of this violation of a fundamental principle of the U.S. T-I-E sector by AT&T demonstrates that it was implemented surreptitiously. AT&T did not launch an open, transparent and honest debate about whether there might be sufficient mitigating circumstances, e.g., the interference issues it refers to whenever non-interoperability is criticized, or benefits to justify even a limited and temporary, let alone a pervasive and permanent abandonment of the basic principle of interoperability.

In fact a key element in non-interoperability – the introduction of the now infamous Band Class 17 applicable only to the U.S. market – was instigated in the global

⁷ Regulations may not be necessary if industry itself finds a solution, which unfortunately is not the situation for LTE non-interoperability.

standards body 3GPP⁸, in which at the time (2008) neither the FCC nor any of the smaller holders of 700 MHz licenses were present or represented.⁹

A decision on a fundamental departure from the established public policy and practice of interoperability should only have been taken – if at all – after a thorough debate involving all interested parties and independent assessments of whether or not such a move was justifiable, and, if so, how to mitigate and minimize its harmful effects. Yet AT&T chose to initiate non-interoperability unilaterally without, to the best of our knowledge, making the slightest let alone a serious attempt to engage other affected parties and interests in any such debate. Furthermore, key decisions about non-interoperability – the establishment of Band Class 17 for AT&T alone – were taken in the 3GPP, a forum from which at the time AT&T knew that both the FCC and most other 700 MHz Lower Band licensees were absent.

The claims of AT&T regarding the costs it would have to incur to eliminate non-interoperability, and the burden that would then have to be borne by U.S. mobile customers, are vastly exaggerated, as has been demonstrated in the references cited in Appendix 1.

AT&T's resistance to ensuring interoperability betrays an attitude on its part that rejects accountability and responsibility. AT&T is implying that others should pay to clean up, or continue to suffer from a situation of AT&T's own creation that has arisen solely as a result of its initiative in creating non-interoperability despite major negative consequences for many other stakeholders. Moreover, as noted, this situation was established in a maneuver with no attempt, to the best of our knowledge, to seek an open and independent review of its consequences and implications. An analogy to AT&T's behavior would be a developer of a major urban building project for new residences and businesses who ignored the question of its impact on traffic flows, and then complained after it was built that he or she should not be held responsible in any way for the disruption to others or for the investments that might be needed to build new roadways or other infrastructure to handle the increased volume of vehicular and pedestrian traffic.

IAE recently explained how AT&T is moving rapidly to create yet more facts on the ground (or in the base stations) to make sure that non-interoperability becomes a pervasive and permanent feature of the U.S. LTE landscape¹⁰. One aspect of these plans is the exploitation of versions of carrier aggregation formulated in the 3GPP

⁸ Third Generation Partnership Project, a global standards organization responsible, among other areas, for the development and maintenance of LTE technologies and standards.

⁹ Documents relating to the establishment of AT&T's non-interoperable 700 MHz Lower Band Class 17 by the 3GPP can be found at

http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_47/Docs/, and the timeline of events leading to non-interoperability in the 700 MHz band can be found in a filing (see p. 3) by Vulcan Wireless at <http://apps.fcc.gov/ecfs/document/view?id=7520930853>

¹⁰ Information Age Economics, <http://apps.fcc.gov/ecfs/document/view?id=7022421105>

that are operator-specific as is Band Class 17, because these versions include this non-interoperable and exclusive band.

The non-interoperable “feature” of the U.S. mobile broadband market will only be found elsewhere in Canada and a few Caribbean islands that are, in practice, obliged to follow the U.S. in spectrum allocations. Non-interoperability has been rejected everywhere else in the world, including Latin America from Chile in the south to Mexico, the southern neighbor of the U.S., in the north i.e., ITU (International Telecommunication Union) Region 2 that has traditionally followed the U.S. lead in spectrum management and allocations.

The non-interoperable practices of AT&T are inconsistent with the proclamations of the value of interoperability that its senior executives have made on various occasions, as well as with statements by the CTIA, in which AT&T wields considerable influence, about the value of achieving global spectrum harmonization wherever possible¹¹.

Randall Stephenson, AT&T’s CEO, declared in an interview he gave at the Mobile World Congress in February 2011, *“History has shown that we have to make all of these networks, we have to make all of these operating systems, interoperable. And so to the extent that we can get more openness, more seamlessness, more interoperability among network providers, among apps, among OSs and devices, then the bigger we make this pie, we cause this thing to grow much faster and make it a much more pervasive part of business and society”*.¹² In this same video Mr. Stephenson said that interoperability was not inconsistent with profitability, pointing to the example of text messaging, a service that took off once inter-operator and not merely intra-operator messaging was introduced. Mr. Stephenson also more recently expressed his enthusiasm about the potentially positive impact of mobile broadband on *all* sectors of the economy¹³, thereby implicitly acknowledging that the **consequences of non-interoperability will be felt throughout the U.S. economy, not just in the wireless sector**.

There is a glaring contradiction between the actions of AT&T in introducing, and aggressively expanding, LTE non-interoperability in the U.S. and these simultaneous and irreconcilable proclamations of its good faith in and acknowledgment of the

¹¹ CTIA Press Release, <http://www.ctia.org/media/press/body.cfm/prid/2246>

¹² <http://video.cnbc.com/gallery/?video=1796966487&play=1>, after 1’ 30” into this video; also AT&T chairman urges open devices, platforms and networks globally,” [http://www.computerworld.com/s/article/9209502/AT T chairman urges open devices platforms and networks globally](http://www.computerworld.com/s/article/9209502/AT_T_chairman_urges_open_devices_platforms_and_networks_globally);

¹³Randall Stephenson, Keynote Speech at the Mobile World Congress, Barcelona, February, 2013, <http://www.mobileworldlive.com/mwc13-keynote-att> (his enthusiastic remarks about the impact of mobile broadband on all sectors of the economy can be found at around 4’ 40” into the video).

intrinsic value of interoperability. AT&T's leadership proclaims that interoperable broadband networks and other open platforms can be and indeed are, vital to fuel progress in all sectors of the economy and for all members of society, while at the same time AT&T has been making and is planning further large investments in non-interoperability.

The Unilateral Role of AT&T in Introducing Non-Interoperability

AT&T introduced non-interoperability in its LTE deployments through Band Class 17 (700 MHz Lower Band B and C blocks). FCC Docket 12-69 (*In The Matter Of Promoting Interoperability in the Commercial 700 MHz Spectrum*) is addressing non-interoperability across paired frequencies (i.e. also including Block A) in the 700 MHz Lower Band. The alleged necessity for and benefits of non-interoperability have been defended consistently and vigorously in this Docket by AT&T and various economists and consultants it has hired to agree with it during a period of over two years while coverage of AT&T's non-interoperable LTE network has been expanded to cover more than 225 million people (about 71% of the U.S. population) as of July, 2013¹⁴.

The obstacles U.S. Cellular and other 700 MHz Lower Band Block A licensees have encountered and continue to face in generating value for themselves and their customers through use of the 700 MHz Band are a direct and avoidable consequence of AT&T's actions with respect to Band Class 17.

Conclusion

This filing has built on extensive evidence and analyses submitted in FCC Docket 12-69 and from other sources and has presented inferences from the actions of AT&T that support the following conclusions that are particularly relevant to Dockets 13-135 and 12-69 and should also be taken into consideration in other ongoing Dockets:

- Non-interoperability is significantly eroding the competitive intensity of the U.S. mobile market and will further undermine it, probably irreparably, as its impact becomes broader and deeper thanks to the rapid adoption of LTE as the dominant wireless technology and ecosystem in this market.
- Non-interoperability represents a violation of a fundamental core principle of the U.S. T-I-E sector that has been embodied in legislation since the Communications Act of 1934 and reaffirmed since then in the Telecommunications Act of 1996.
 - *Non-interoperability is not a practice that is being adopted anywhere else in the world, except in Canada and a few Caribbean islands that, for*

¹⁴ <http://about.att.com/newsroom/att4gltenowcoversmorethan225millionpeople.html>

reasons of geography and economics, have little choice but to follow U.S. spectrum allocations.

- Non-interoperability is the source of multiple harms and denials or unnecessary and undesirable reductions of benefits to many U.S. stakeholders and to the health of the U.S. economy by:
 - *Raising barriers to customers' freedom of choice;*
 - *Enhancing the power of AT&T to control access to its customers by other operators and third party suppliers of services and applications;*
 - *Distorting conditions for negotiating international roaming arrangements by creating a monopsony in U.S. territory;*
 - *Reducing opportunities for innovation and job creation by inhibiting third parties' access to customers and increasing costs through unnecessary market fragmentation.*
- Non-interoperability will have widening cost, competitive and operational repercussions throughout the U.S. economy, as a growing number of devices and products used in sectors from health care to financial services, transportation, rights-of-way companies, agriculture, etc., become connected wirelessly.
- The actions of AT&T provide circumstantial evidence that it is pursuing a strategy to exploit non-interoperability solely for its own benefit as a means to reduce competition and enhance its market power to the point where it becomes effectively unchallengeable.
 - *The actions of AT&T in propagating non-interoperability belie this company's repeated assertions about its commitment to the value of, and need for, interoperability across networks, devices and applications in order to deliver the maximum benefits of mobile broadband to the greatest number of people and fuel progress in all sectors of the economy.*
- The U.S. mobile wireless market cannot be found to be effectively competitive as long as non-interoperability between major LTE networks persists.
- The clock is at a minute to midnight if the tide of LTE non-interoperability is to be halted and then rolled back. The ultimate consequences of wireless network non-interoperability are far too important to be left to the discretion of decisions made by AT&T that do not or do not need to take into account the legitimate interests of other key stakeholders both within and outside the wireless sector.

Appendix 1: Non-Interoperability - Selected Evidence and Analyses

(Interoperability in this context refers to interoperability across all paired frequencies in the 700 MHz Lower Band, i.e. Band Class 12)

Source	Document Reference	Topics Covered
Vulcan Wireless	http://www.interoperabilityalliance.org/wp-content/uploads/2012/09/Vulcan-Wireless-Reply-Comments-to-the-FCC.pdf	Demonstrates the technical and financial feasibility of restoring interoperability and rebuts AT&T's claims of the need for non-interoperability
	http://apps.fcc.gov/ecfs/document/view?id=7520930853	Rebuts the interference-based justification for non-interoperability and delineates the justification and legal basis for the FCC to mandate interoperability
	http://apps.fcc.gov/ecfs/document/view?id=7022115941	Provides information on the costs that would be incurred to restore interoperability
	http://apps.fcc.gov/ecfs/document/view?id=7022053963 (with C Spire Wireless)	Provides information on the impact on devices and base stations of restoring interoperability
U.S. Cellular	http://apps.fcc.gov/ecfs/document/view?id=7022068202	Assesses the importance of restoring interoperability to the development of the LTE ecosystem
Cavalier Wireless	http://apps.fcc.gov/ecfs/document/view?id=7520924831	Outlines the history of attempts over several years to restore interoperability and delineates the harm caused to rural communities by non-interoperability
Rural Telecommunications Group	http://apps.fcc.gov/ecfs/document/view?id=7520924138	Analyzes and presents recommendations for improving competition in the wireless sector including an interoperability mandate
Competitive Carriers Association	http://apps.fcc.gov/ecfs/document/view?id=7022115924	Presents an analysis of the incremental costs involved in restoring interoperability

Continuum 700 LLC and King Street Wireless	http://apps.fcc.gov/ecfs/document/view?id=7520927862	Demonstrates the need for interoperability and the absence of any reason not to mandate it.
4G Coalition Members	http://competitivecarriers.org/wp-content/uploads/2010/05/Combined-Final-4G-Coalition-Ex-Parte.pdf	Analyzes the 700 MHz Band to demonstrate that interoperability will increase competition and the value and utilization of spectrum in this Band
Information Age Economics	http://apps.fcc.gov/ecfs/document/view?id=7022017276;	Identifies how non-interoperability will soon be expanded by AT&T through the use of LTE inter-band carrier aggregation and the implications of future LTE-only devices
	http://competitivecarriers.org/uncategorized/non-interoperability-at-700mhz-lower-revenues-higher-prices/916674	Describes the several categories of harm caused by non-interoperability
Cavalier Wireless, C Spire Wireless, Continuum , Metro PCS, U.S. Cellular, King Street Wireless, Vulcan Wireless	http://apps.fcc.gov/ecfs/document/view?id=7021920804	Presents test results to show that interoperability between 700 MHz Lower Band Blocks A, B, and C is technically feasible
U.S. Cellular	http://apps.fcc.gov/ecfs/document/view?id=7520931097	Describes significant gaps in availability of devices due to lack of scale for Band Class 12 and future non-interoperability problems when devices capable of carrier aggregation are introduced; rebuts AT&T's assertions of difficulties in developing Band Class 12/17 devices and changing its device road map

Appendix 2: Impact of Device Availability on the Value of Frequencies for Small Operators

A contemporary example from Canada confirms the finding that if mobile networks are not deployed in particular frequencies by a large operator to generate demand for devices that work in these frequencies then their value for smaller operators is inevitably greatly reduced.

In 2008 a spectrum auction for the PCS G-block (2 x 5MHz) was held in Canada at a time when no cellular systems were deployed and there were no devices operating or under development at these frequencies. As a result there was little interest in the G-block licenses that were acquired by two small companies, Novus Wireless and a start-up Public Mobile. The prices per MHz-POP paid for the G-block, which were part of the Canadian auction of AWS frequencies, were only around one-sixth of the prices paid for AWS blocks of 2 x5 MHz in the same geography. In contrast to the G-block, large-scale deployments of mobile broadband systems and hence the availability of AWS-capable devices were foreseeable since the U.S. had assigned AWS licenses to major operators in the FCC Auction 66 in 2006.

Novus Wireless has not used its G-block frequencies while Public Mobile, recently acquired by two private equity firms, has deployed a CDMA network in its G-block license areas in Southern Ontario and Greater Montreal. It has a cellular market share of less than 1%.

However, recently Sprint that has more subscribers than all Canadian operators combined has begun to deploy LTE in its G-block spectrum in the U.S. in the initial stage of implementation of its Network Vision. The subsequent availability of LTE devices that operate in the G-block has awakened interest in Canada in these formerly “orphan” frequencies. As a result in mid-2013 the third largest Canadian operator Telus acquired Novus Wireless’ G-block frequencies to bolster its spectrum portfolio for LTE deployments.