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EXECUTIVE SUMMARY

The record established in the initial round of this proceeding reflects widespread agreement that the Commission can and should take prompt action to restore interoperability in the Lower 700 MHz band, which existed until shortly after the conclusion of Auction 73. The highly unusual and unique facts that led to the development of multiple Lower 700 MHz band classes—together with the severe, ongoing harm to consumers and competitive carriers that has resulted from it—have yielded the type of unforeseeable “worst case scenario” for which regulatory action is necessary. The Commission should therefore exercise its clear legal authority in this case to restore interoperability in the Lower 700 MHz band. Although reconsolidation of the Lower A, B, and C Blocks can be accomplished promptly, with minimal cost to licensees, equipment makers, and consumers, the Commission need not decide how to implement interoperability as a practical matter, nor should the Commission prescribe any technical specifications, or assume the duties of the 3rd Generation Partnership Project (“3GPP”). Rather, the Commission can require interoperability and establish a framework to enable industry participants to collectively determine how to best achieve interoperability in the Lower 700 MHz band. This proceeding therefore represents an opportunity for the Commission to facilitate an industry solution for implementing Lower 700 MHz interoperability.

The initial round of comments demonstrated not only the numerous public interest benefits that would follow from interoperability, but also the feasibility and practicality of adopting Band Class 12 as the standard to achieve interoperability in the Lower 700 MHz band. Vulcan continues to believe that Band Class 12 offers the most technically viable and practical solution for achieving interoperability, with minimal transition costs. However, Vulcan believes that determining the means of implementing Lower 700 MHz interoperability need not be the Commission’s central goal in this proceeding. Rather, the Commission need only require the

restoration of interoperability in the Lower 700 MHz band, consistent with all other wireless bands, and establish a timeline for achieving it, without requiring the adoption and implementation of Band Class 12.

By simply requiring the restoration of interoperability within a given timeframe, the Commission will facilitate and incentivize an industry solution to achieve interoperability in a timely manner, thereby restoring competition, enhancing consumer welfare, and promoting more efficient use of spectrum in the Lower 700 MHz band. This action will facilitate an industry driven solution by allowing all licensees and vendors to collectively and cooperatively utilize the 3GPP process to determine the most efficient and effective manner of restoring interoperability, thereby allowing industry to freely evaluate the merits of modifying Band Class 12 or Band Class 17 or employing another type of hybrid Band Class solution to effect Lower 700 MHz interoperability. An order that simply requires such interoperability would be consistent with the Commission's precedent of promoting competition and empowering consumers, and would establish for the Lower 700 MHz band a core characteristic of the other spectrum bands allocated for commercial mobile radio service. Should the Commission nevertheless prefer to take more immediate and deliberate action to achieve interoperability in the Lower 700 MHz band, it should adopt the proposal to require Band Class 12 as the solution. The merits of Band Class 12, supported by a majority of commenters in this proceeding, are discussed in this filing.

Opponents of interoperability have focused all of their technical objections on Band Class 12, without addressing other potential vehicles to achieve interoperability. Even in this narrow context, they have failed to provide any reliable facts, data, or other evidence to support their tenuous claims that restoring interoperability would be contrary to the public interest. The failure by these parties to provide such data is remarkable given the number of opportunities that they have had within the last four years to conduct their own technical studies, and the billions of

dollars in resources that such parties have at their disposal to do so. Moreover, their failure to provide sound, fact-based evidence to confirm their claims directly flouts the Commission's express plea for reliable "data and evidence" in this proceeding, including its request that commenters "be as specific as possible" regarding the effects of interoperability and to "submit measurements and quantitative analyses" to support their technical arguments and conclusions. By striving for such a fact-driven process, the Commission justifiably recognized that this proceeding should be guided by verifiable data and reasonable assumptions—not by unproven allegations or armchair theorizing.

Rather than provide data-based evidence to support their positions (and without even attempting to do so), opponents of interoperability have simply offered unsubstantiated conclusions, unreasonable assertions, theoretical conjecture, and/or misleading data derived from flawed and unrealistic assumptions that do not reflect the characteristics of the networks that have actually been deployed or the performance of devices that are actually sold to consumers. Qualcomm, for example, used the initial round of comments to assert new allegations that high-powered E Block transmissions will cause intermodulation interference to Band Class 12 devices, without providing any supporting data or empirical testing. This new, unsubstantiated claim is not only refuted by the V-COMM Study (as described below), but it evidences the manner in which interoperability opponents have raised concerns without offering adequate support. Additionally, their objections to the technical studies that have been performed (which overwhelmingly demonstrate the technical feasibility and sufficiency of Lower 700 MHz interoperability) are without merit.

The insistent and unsubstantiated opposition to restoring interoperability confirms that an industry-based decision to restore interoperability is not likely to emerge without Commission action. In addition, the Commission should interpret the failure of AT&T, Qualcomm, and other

opponents of interoperability to provide any reliable technical data in this proceeding as evidence that no such data exist, and that the engineering studies and analyses that have been submitted to the record—the Lower A Block Study and V-COMM Study—are not in dispute. By continuing to place great weight on data, established facts, and reasonable assumptions in this proceeding, the Commission will arrive at a more justifiable outcome that furthers the public interest.

Interoperability within each commercial mobile band has been the cornerstone of competition in the wireless industry. It has endowed consumers with the ability to choose among mobile devices, services, and rates, with the security of knowing that their chosen technology will function across multiple networks and platforms anywhere in the country. Through unforeseeable marketplace developments, however, interoperability has been erased in the Lower 700 MHz band, crippling the small, regional, and greenfield wireless operators that are essential to robust competition and consumer welfare. The unanticipated development of Band Class 17 has inhibited the deployment of service in the Lower A Block—25% of the entire Lower 700 MHz band—in contravention of the Commission’s spectrum-related goals. Likewise, the disjointed Lower 700 MHz band has diminished competition from other service providers and substantially harmed consumers, who have little choice of services, mobile devices, or rates in the Lower 700 MHz band.

The Commission well knows the value of the Lower 700 MHz band. As “beachfront” spectrum, it will be the pioneer ground upon which the most advanced wireless services will be deployed. Yet the innovation, competition, and consumer welfare that the Lower 700 MHz spectrum can bring to the marketplace is in jeopardy, absent Commission action to restore interoperability across the A, B, and C Blocks. These losses will continue to have far reaching effects by reducing valuable jobs in the telecommunications industry across the country and by hamstringing the country’s competitiveness in an increasingly global marketplace.

Restoring interoperability will not just eliminate the unforeseeable technical hurdles that have burdened the Lower A Block licensees from offering competitive mobile broadband service since 2008. Rather, as reflected in the initial round of comments of this proceeding, restoring interoperability will further the public interest by:

- Empowering consumers throughout the country by removing artificial limitations that permanently prevent them from using their mobile devices across the Lower 700 MHz band;
- Promoting competition among mobile broadband service providers;
- Stimulating innovation in the development of advanced mobile devices;
- Facilitating the development of nationwide roaming arrangements; and
- Enabling a more productive and efficient use of the limited supply of spectrum suitable for mobile broadband service.

A principal reason why the foregoing public interest benefits have not yet been realized through Lower 700 MHz interoperability is because AT&T (the nation's second largest carrier with a dominant share of B and C Block spectrum) and several of its device vendors continue to assert unsubstantiated claims that Lower 700 MHz interoperability will yield harmful interference to Band Class 12 devices operating on Lower B and C Block spectrum. Yet the evidence submitted to the record does not support such claims. Rather, the technical evidence before the Commission reveals that Band Class 17—the source of non-interoperability in the Lower 700 MHz band—has no practical value or basis for existing. Consequently, each justification proffered for Band Class 17 has been decisively refuted by empirical data gathered from reliable engineering studies, conducted under realistic conditions and with reasonable assumptions.

The record shows that the Commission can restore interoperability, and harness the enormous public interest benefits described above, in a prompt manner that imposes minimal cost on licensees, device makers, and consumers. Specifically, Vulcan recommends that the

Commission promptly adopt an order requiring interoperability in this proceeding by the end of 2012, and establish a clear framework through which the 3GPP and the relevant market participants can implement an industry solution. The Commission should determine the implementation deadline and continue to monitor 3GPP meetings and activities to ensure progress and cooperation. If the deadline is not met, then the Commission should adopt Band Class 12 as the *de facto* fallback standard to be used for the Lower 700 MHz band, as recommended by the majority of parties in this proceeding. This approach will facilitate and incentivize an industry solution to achieve interoperability in a timely manner, thereby restoring competition, enhancing consumer welfare, and promoting more efficient use of spectrum in the Lower 700 MHz band.

that interoperability would further the public interest—by restoring competition, enhancing consumer welfare, and promoting the more efficient use of spectrum (among other benefits)—the Commission can create a clear framework through which the 3rd Generation Partnership Project (“3GPP”) and the relevant market participants can arrive at an industry solution for how to best implement interoperability. The Commission can determine the deadline by which implementation must be achieved, and continue to monitor 3GPP meetings and activities to ensure that all parties work cooperatively towards achieving the interoperability requirement. If the deadline is not met, then Band 12 should be the *de facto* fallback standard to be used for the Lower 700 MHz band. Accordingly, Vulcan urges the Commission to take prompt measures to require interoperability in the Lower 700 MHz and facilitate an industry solution for its implementation.

II. THE TECHNICAL EVIDENCE CONFIRMS THAT RESTORING LOWER 700 MHZ INTEROPERABILITY WOULD NOT ADVERSELY IMPACT LOWER B AND C BLOCK DEVICES.

The consistent failure of opponents of interoperability (including AT&T and Qualcomm) to provide any valid quantitative measurements, empirical data, or other evidence to show how Channel 51 and high-powered E Block transmissions will adversely impact Band Class 12 devices on the B and C Blocks should figure prominently into the Commission’s resolution of this proceeding. Such failure is remarkable given the number of opportunities that these parties have had to obtain such data, the vast financial resources they have at their disposal, and the Commission’s express direction in the NPRM that commenters in this proceeding support their positions with quantitative and qualitative data. Instead, these parties have offered nothing more than theoretical conjecture, unproven assertions, and misleading analysis that defies and ignores practical reality.

By contrast, proponents of interoperability have repeatedly provided the Commission with meaningful evidence demonstrating that a reconstituted Lower 700 MHz band would not result in harmful interference, is technically feasible, and would further the public interest. A recent technical study conducted by V-COMM, LLC, confirms that Channel 51 and E Block signals will not cause harmful interference to Band Class 12 devices operating in the Lower B and C Blocks (the “V-COMM Study”).² Likewise, the initial round of comments reflect widespread agreement that the engineering tests and analyses conducted by a consortium of Lower A Block licensees (the “Lower A Block Study”)³ conclusively demonstrates that Band Class 17 has no practical basis.⁴ The objections to the Lower A Block Study remain unsubstantiated and meritless.

² See Reply Comments of V-COMM, LLC, WT Docket 12-69 (filed July 13, 2012) (“*V-COMM Study Report*”); see *infra* Section II.B.

³ See Ex Parte Letter from Michele C. Farquhar, Hogan Lovells, Counsel to Vulcan Wireless, et al., to Marlene H. Dortch, Federal Communications Commission, WT Docket No. 12-69 (May 25, 2012), Attachment, “*Lower 700 MHz Test Report: Laboratory and Field Testing of LTE Performance near Lower E Block and Channel 51 Broadcast Stations*” (“*Lower A Block Study*”); See also Letter from Michele C. Farquhar, Counsel to Vulcan Wireless LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 11-18, RM-11592 (Nov. 30, 2011). The consortium of Lower 700 MHz A Block licensees that conducted the Lower A Block Study include Vulcan, Cavalier Wireless, C Spire Wireless, Continuum 700, King Street Wireless, MetroPCS, and U.S. Cellular.

⁴ See Comments of Vulcan Wireless, WT Docket No. 12-69, at 11-17 (June 1, 2012) (“Vulcan Comments”); Comments of U.S. Cellular, WT Docket No. 12-69, at 6 (June 1, 2012) (“U.S. Cellular Comments”); Comments of T-Mobile, WT Docket No. 12-69, at 14-16 (June 1, 2012) (“T-Mobile Comments”); Comments of the National Telecommunications Cooperative Association, WT Docket No. 12-69, at 8 (June 1, 2012) (“NCTA Comments”); Comments of King Street Wireless, WT Docket No. 12-69, at 13 (June 1, 2012) (“King Street Comments”); Comments of Cavalier Wireless LLC and Continuum 700 LLC, WT Docket No. 12-69, at 10 (June 1, 2012) (“Cavalier & Continuum Comments”); Comments of Cricket Communications Inc., WT Docket No. 12-69, at 6 (June 1, 2012) (“Cricket Comments”); Comments of Cellular South, Inc., WT Docket No. 12-69, at 10 (June 1, 2012) (“Cellular South Comments”); Comments of Rural Telecommunications Group, Inc., WT Docket No. 12-69, at 14 (June 1, 2012) (“RTG Comments”); Comments of MetroPCS, WT Docket No. 12-69, at 4-7 (June 1, 2012) (“MetroPCS Comments”).

A. Opponents of Interoperability Have Not Submitted Any Valid Quantitative Measurements, Empirical Data, or Other Evidence To Undermine the Conclusions of the Lower A Block Study.

1. AT&T Has Failed to Provide Any Data to Support Its Tenuous Position That Interoperability Will Adversely Impact Lower B and C Block Device Reception.

AT&T, the most vocal opponent of interoperability (together with its equipment vendors), has consistently failed to demonstrate, through technical data or reasonable analysis, why interoperability is not feasible in the Lower 700 MHz band. Not only has AT&T attacked the Commission's suggested proposal of achieving interoperability by substituting Band Class 12 for Band Class 17, it has simply ignored the fact that other potential solutions may exist, such as through modifications to Band Class 17 or 12, or some other means, as though an interoperability solution is not available under any circumstances. This indifference towards exploring other options for reconsolidating the Lower A, B, and C Blocks demonstrates a disregard for the Commission's objectives in this proceeding.

AT&T's claims that interoperability cannot be accomplished in the narrow context of Band Class 12 lack support and are meritless. AT&T has had years to conduct engineering tests to objectively demonstrate how and why Band Class 12 devices cannot adequately filter Channel 51 and high-powered D and E Block transmissions. Indeed, ever since Band Class 17 was first proposed in May 2008—over four years ago—AT&T has had the opportunity to empirically validate its concerns regarding out-of-block transmissions. Even if it saw no reason to conduct engineering tests at that time, it could have done so in September 2009—nearly three years ago—after the 700 MHz Block A Good Faith Purchasers Alliance first petitioned the Commission to

restore interoperability in the Lower 700 MHz band.⁵ If AT&T still found no reason at that time to verify its allegations through real world data, it could have performed the necessary engineering studies for this proceeding, particularly given the Commission’s express request that parties responding to the NPRM support their technical arguments and conclusions with “measurements and quantitative analyses.”⁶

Yet neither AT&T, nor any other opponent of Lower 700 MHz interoperability, has provided the Commission with any valid engineering data or analysis. Rather, it has only provided theoretical conjecture and unproven conclusions to support Band Class 17. Likewise, AT&T has not even attempted to justify the severe public interest harms caused by the uniquely disjointed Lower 700 MHz band plan, claiming only that “science” alone justifies the need for Band Class 17.⁷ In fact, the Lower A Block Study and new V-COMM Study both indisputably, and independently, confirm that Channel 51 and high-powered E Block transmissions would have no material impact on Band Class 12 devices operating on the Lower B and C Blocks.

The technical analysis that AT&T offered consists of nothing more than an academic white paper authored by a consultant and a college professor, and included no lab tests, no field measurements, and no other evidence to support the conclusory statements that Band Class 12 devices are inadequate to protect B and C Block reception.⁸ Additionally, AT&T’s white paper contained a number of errors, flawed assumptions, and incorrect conclusions that render it wholly unreliable, even as an academic exercise. For example, the authors of the white paper misinterpret

⁵ 700 MHz Block A Good Faith Purchaser Alliance Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on All Paired Commercial 700 MHz Frequency Blocks, RM-11592 (filed Sept. 29, 2009) (“*Good Faith Alliance Petition*”).

⁶ *NPRM* ¶ 40; *see also id.* ¶ 45 (seeking “qualitative and quantitative data and engineering analyses to support commenters’ claims”).

⁷ *See* Comments of AT&T Services Inc., WT Docket No. 12-69, at 7 (June 1, 2012) (“AT&T Comments”).

⁸ *See Id.* at Exh. A (“Impact of Channel 51 and E Block Interference on Band 12 and Band 17 User Equipment Receivers,” by Jeffrey H. Reed and Nishith D. Tripathi).

the 3GPP LTE device specifications, mistakenly conclude that a scientific method is not applicable to evaluating the Lower 700 MHz band for incongruous reasons, mischaracterize the 3GPP process that led to the establishment of Band Class 17, demonstrate a fundamental misunderstanding of the receiver blocking interference mechanism and the function of device filters in attenuating nearby signals, and even misstate the year in which Auction 73 occurred (among other mistakes, oversights, and invalid or irrelevant findings). A list and description of the various deficiencies in AT&T's white paper are set forth in Part A of Exhibit 1 to these reply comments.

AT&T's failure to provide quantitative data and empirical measurements is particularly troubling for a number of reasons. *First*, as demonstrated by the Lower A Block Study and the V-COMM Study, and contrary to AT&T's unfounded assertions to the contrary, it is relatively easy to design and conduct engineering tests to measure the effect of Channel 51 and high-powered E Block transmissions on Lower 700 MHz device reception.⁹ This is especially the case for AT&T, which has at its disposal a number of actual Lower 700 MHz handsets to analyze. Yet AT&T did not do so, even though it criticized the Lower A Block Study for failing to examine actual Band Class 12 devices—a criticism that, as explained further below, lacks merit because no Band Class 12 devices were commercially available at the time of the Lower A Block Study due to the lack of interoperability (and is obviated by the V-COMM Study, which did measure Band Class 12 devices).¹⁰ *Second*, AT&T has been especially vocal and ardent in expressing concerns that Band Class 12 devices will be susceptible to such interference.¹¹ The Commission should

⁹ See *infra* Section II.D.1.

¹⁰ See *infra* Section II.D.2.

¹¹ See, e.g., Ex Parte Letter from Joseph P. Marx, Assistance Vice President, AT&T Services Inc., to Marlene H. Dortch, Secretary, FCC, RM-11626, RM-11592 (Feb. 28, 2012).

reasonably expect that such fervor would be supported by sound engineering tests and analyses, rather than theoretical conjecture and a misunderstanding of engineering data.

Third, AT&T has enormous resources at its disposal to design and conduct the technical analyses necessary to substantiate its claims that Band Class 12 is inadequate for Lower B and C Block devices.¹² Despite these vast resources—financial and otherwise—AT&T has remarkably chosen not to perform the necessary empirical testing. Indeed, no such data exist, as certainly AT&T would have inundated the record if such data did exist. *Fourth*, AT&T’s failure to conduct any engineering studies reflects blatant disregard for the Commission’s request for commenters in this proceeding to provide “data and evidence,”¹³ to “be as specific as possible”¹⁴ regarding the effects of interoperability, and to “submit measurements and quantitative analyses” to support their technical arguments and conclusions.¹⁵ In light of the dramatic costs that the lack of interoperability has imposed on the public, such a data-driven analysis, in a practical context, should be central to the Commission’s determination in this case.

The absence of empirical testing and measurements from AT&T (and any other Band Class 17 proponent) is telling, and the Commission should not disregard it as an immaterial omission. The lack of rigorous technical data should cast serious doubt on the need for Band Class 17, and provide the Commission with an adequate basis to conclude that such data do not exist. Accordingly, the Commission should find that the results from the only reliable lab and

¹² For the fiscal year end December 31, 2011, AT&T earned \$56 billion in revenue from the provision of wireless service. See AT&T Inc., Annual Report (Form 10-K) (Dec. 31, 2011).

¹³ *NPRM* ¶ 21; see also *id.* ¶ 25 (seeking “specific data . . . to support claims that an interoperability obligation would require complete redesign and upgrade of devices and base stations”); *id.* ¶ 53 (seeking “data on consumer benefits that may result from interoperability”).

¹⁴ *Id.* ¶ 26; see also *id.* ¶ 55 (asking commenters to “provide specific data and information” regarding the costs and benefits that directly result from restoring Lower 700 MHz interoperability).

¹⁵ *Id.* ¶ 40; see also *id.* ¶ 45 (seeking “qualitative and quantitative data and engineering analyses to support commenters’ claims”).

field studies presented in the record—the Lower A Block Study and V-COMM Study (as described below)—provide indisputable evidence that restoring interoperability in the Lower 700 MHz band will not adversely impact device reception in the B and C Blocks.

2. Qualcomm’s Technical Analysis Is Flawed and Based Upon Unrealistic and Unreasonable Assumptions.

The Commission should likewise discount Qualcomm’s unsubstantiated conclusions that Band Class 12 devices do not effectively filter harmful interference from Channel 51 and E Block transmissions.¹⁶ Like AT&T, Qualcomm has not provided any valid test data or empirical evidence regarding 700 MHz devices or components, despite its significant financial resources¹⁷ and the Commission’s request that commenters support their technical claims with quantitative data and empirical measurements.¹⁸ Although Qualcomm did attempt to address the issue at hand—whether Band Class 12 can adequately filter adjacent channel emissions (a question that AT&T bizarrely asserts is irrelevant)—its flawed analysis relies upon unrealistic assumptions. A list and description of the deficiencies in Qualcomm’s comments are set forth in Part B of Exhibit 1 to these reply comments.

As a threshold matter, Qualcomm did not test any actual 700 MHz devices or components, and therefore could not quantify actual device performance. The lack of such testing is puzzling, not only because such devices exist (but only within the last few months in the case of Band Class 12 devices), but also because Qualcomm manufactures the components for such devices (and has established relationships with the major device makers). The Lower A Block Study and

¹⁶ Comments of Qualcomm Incorporated, WT Docket No. 12-69 (June 1, 2012) (“Qualcomm Comments”).

¹⁷ For the fiscal year end September 25, 2011, Qualcomm earned approximately \$15 billion in revenue. See Qualcomm Incorporated, Annual Report (Form 10-K) (Sept. 25, 2011).

¹⁸ See *supra* nn. 13-15 and accompanying text.

V-COMM Study avoided this analytical shortcoming by using commercially available devices, thereby providing more reliable data based on fact-based, real world testing.

Qualcomm's technical analysis also suffers from a number of flawed assumptions that render it unreliable as a practical matter. *First*, in conducting its analysis, Qualcomm simulated a Band Class 12 receiver by using the filter characteristics of an unoptimized, off-the-shelf filter.¹⁹ It is well known in the wireless telecommunications industry that off-the-shelf filters are not optimally designed or customized for real world applications. Rather, when a carrier procures a mobile device, it collaborates with the device maker to customize a filter ideally suited for a specific application. Thus, Qualcomm's conclusion that Band Class 17 filters are superior to Band Class 12 filters is overblown and misleading.²⁰

Second, Qualcomm measured Band Class 12 performance assuming a receiver that employed blocker levels specified by the minimum 3GPP standard.²¹ Such analysis rests on the untenable assumption that the minimum 3GPP receiver selectivity would be the actual performance metric for Band Class 12 in the real world. Again, this is not the case. The 3GPP standard represents the minimum standard manufacturers must meet, and manufacturers typically design their radios to exceed the 3GPP standard to effectively function in practice. Even AT&T, Qualcomm, and other opponents of interoperability would agree that the receiver selectivity for devices in the Lower 700 MHz band would need to be substantially better than the minimum 3GPP specification in real world applications, if only to handle potential interference from adjacent bands.

¹⁹ Qualcomm Comments at 8 n.12.

²⁰ *See id.* 9.

²¹ *See id.* at 7-8.

Because Qualcomm obtained no empirical data, it cannot justify its assumption that commercially available 700 MHz devices would perform so poorly. In fact, the Lower A Block Study and V-COMM Study each confirmed that commercially available 700 MHz devices substantially exceed the minimum 3GPP receiver selectivity²²—none of the actual devices tested in those studies featured receiver selectivity that was even close to the minimum 3GPP specifications. Accordingly, Qualcomm’s analysis does not portray a “real world” scenario for Band Class 12 devices—it portrays a straw-man scenario that device manufacturers and network operators would simply never allow in practice, and which the Lower A Block Study and V-COMM Study confirm is not the case with existing 700 MHz devices. In practice, filters are optimized and receiver selectivity far exceeds the 3GPP specifications. Thus, Qualcomm’s examination of the performance of an unrealistically weak and hypothetical Band Class 12 device should have no bearing on the Commission’s decision to restore interoperability across the Lower 700 MHz band in this proceeding.

The foregoing assumptions, which infiltrate each of Qualcomm’s technical conclusions, render Qualcomm’s analysis misleading, and therefore not useful for evaluating whether a reunified Lower 700 MHz band class will adversely impact B and C Block devices. For example, Table 2 of Qualcomm’s comments purports to show that Band Class 12 filters will not reject high-powered E Block signals when the received power is -49 dBm or higher.²³ However, that conclusion rests on hypothetical modeling that assumes 700 MHz devices will employ the minimum 3GPP receiver selectivity of -56 dBm.²⁴ Consequently, Qualcomm’s conclusion regarding the potential for blocking interference caused by high-powered E Block transmissions is

²² See *Lower A Block Study* at 24, Figure 4.2 (demonstrating that commercial devices perform 28-39 dB better than the minimum 3GPP specifications); *V-COMM Study Report* at 5-6.

²³ See Qualcomm Comments at 10.

²⁴ *Id.* at 9.

academic at best, and undermined by empirical measurements (conducted by the Lower A Block Study and the V-COMM Study).

The Lower A Block Study avoided the foregoing defects by using commercially available radios in tandem with real world data, and by removing the RF filter from consideration. Employing such empirical approaches and realistic testing design features, the Lower A Block Study demonstrated that commercially available receivers are not materially harmed by out-of-block interference threats, and that the Band Class 17 filter has no practical use or value. The V-COMM Study used actual Band Class 12 devices, only a few of which became commercially available after the completion of the Lower A Block Study. If Qualcomm had conducted the same analysis using the data obtained by the empirical methods reflected in the Lower A Block Study and V-COMM Study, Qualcomm's results would have further confirmed that Channel 51 and high-powered E Block signals pose no risk of harmful interference (blocking or intermodulation) to Band Class 12 devices.

Qualcomm has also made a *new*, unsubstantiated allegation that high-powered E Block signals would cause intermodulation interference to Band Class 12 devices operating on the Lower B and C Blocks.²⁵ Yet like its other claims, this claim is also invalid. *First*, Qualcomm asserted this claim without providing any supporting data or empirical testing, and without examining actual Lower 700 MHz devices or components. *Second*, since Qualcomm raised this issue in its initial filing, the V-COMM Study set out to perform new testing that would either confirm or refute Qualcomm's claim. That testing provided empirical data specifically demonstrating that intermodulation from high-powered E Block signals is not strong enough to create interference to Band Class 12 devices operating on the B and/or C Block.²⁶

²⁵ *Id.* at 4.

²⁶ *V-Comm Study Report* at 34, Figures 19-24.

Finally, Qualcomm's technical analysis contains a number of inconsistencies and discrepancies. For example, to measure the potential impact of reverse intermodulation interference from Channel 51 stations in large metropolitan areas, Qualcomm predicted Channel 51 signal strength over a wide area using a propagation model that used a receiver antenna height of 10 meters above ground.²⁷ This elevation level is substantially higher than the antenna height of a mobile device at street level, and dramatically overstates the scope of Channel 51 signal coverage found by Qualcomm. The analysis further breaks down in Qualcomm's demonstration of Channel 51 signal strength in Chicago, which assumed a receiver antenna height of only 1.5 meters—a full 8.5 meters lower than that assumed in Qualcomm's propagation model.²⁸ Such a discrepancy in this critical predictive input casts further doubt on the validity of Qualcomm's technical conclusions.

B. The V-COMM Study's Additional Technical Measurements Confirm That Interoperability in the Lower 700 MHz Band Will Not Cause Harmful Interference to Lower B and C Block Device Reception.

The recently conducted V-COMM Study confirms the findings of the Lower A Block Study: restoring interoperability in the Lower 700 MHz band will not result in an increased risk of harmful interference to B and C Block device reception, and Band Class 12 is as effective as, or more effective than, Band Class 17 in managing potential interference from out-of-block signals.²⁹ Accordingly, the V-COMM Study concludes that there is no reason, based upon empirical data (which does not even take into account typical industry engineering practices that would further mitigate the risk of interference), to adopt Band Class 17 in lieu of Band Class 12. Thus, while opponents of interoperability have consistently failed to provide anything other than

²⁷ See Qualcomm Comments at 44, Figure 22.

²⁸ See *id.* at 45.

²⁹ *V-COMM Study Report* at 1.

unsubstantiated conclusions and theoretical conjecture to justify their positions in this proceeding, proponents of interoperability have conducted even more engineering studies and analyses to demonstrate that restoring Lower 700 MHz interoperability is technically viable and in the public interest.

1. Channel 51 Transmissions Do Not Pose a Risk of Harmful Interference to Band Class 12 Devices.

The V-COMM Study confirmed that, even in the most extreme conditions, potential interference from Channel 51 operations is “effectively non-existent.”³⁰ In fact, these measurements revealed that Band Class 12 devices sometimes perform better than Band Class 17 devices,³¹ and further confirmed that the possibility of reverse power amplifier intermodulation (“PA IM”) interference from Channel 51 would not even arise until signal strengths exceeded levels that are impractical to produce for full power and Class A DTV broadcast facilities. As such, V-COMM concluded that the Commission need not take any measures or modify any rules to stem potential interference from Channel 51 operations,³² or take any steps to reduce the trivial threat of interference from existing Channel 51 broadcast operations.³³

2. High-Powered E Block Transmissions Do Not Pose a Risk of Harmful Interference to Band Class 12 Devices.

V-COMM’s measurements likewise demonstrated that high-powered E Block signals are not likely to cause harmful blocking or intermodulation interference to Lower B and C Block devices using Band Class 12.³⁴ As an initial matter, the V-COMM Study noted that no high-

³⁰ *Id.* at 2, 9.

³¹ *Id.* at 9.

³² *Id.* at 30 (citing *NPRM* ¶¶ 42-43).

³³ *Id.* at 31 (citing *NPRM* ¶ 44).

³⁴ *Id.* at 3.

powered Channel 56 E Block deployment exist at this time.³⁵ But even if such operations did exist, the worst performing Band Class 12 devices would operate normally on the Lower B and C Blocks in the presence of any E Block towers. Moreover, the V-COMM Study confirmed that very few populated areas would face the risk of E Block interference,³⁶ and that in urban areas near Channel 56 E Block transmitters the risk of harmful interference was “non-existent.”³⁷ Accordingly, V-COMM concluded that the enormous public interest benefits that would result from restoring Lower 700 MHz interoperability would far outweigh the *de minimis* potential harm that might result from high-powered E Block transmissions.³⁸

3. The V-COMM Study Confirms That Various Objections Made Against the Lower A Block Study Are Meritless.

Not only did the V-COMM Study confirm the findings of the Lower A Block Study, it confirmed that various objections asserted against the Lower A Block Study are invalid. *First*, the fact that V-COMM was able to design and conduct a real world examination of Lower B and C Block performance on Band Class 12 contradicts AT&T’s blind assertion that such an experiment is impossible to design or execute.³⁹ The mere existence of the V-COMM Study casts further doubt on the repeated failure by AT&T and its device makers to conduct real-world technical analyses to substantiate their unrelenting claims, after Auction 73, that Band Class 12 offers B and C Block devices inadequate protection from out-of-block emissions.⁴⁰

³⁵ *Id.*

³⁶ *Id.* at 51.

³⁷ *Id.*

³⁸ *Id.* at 52 (citing *NPRM* ¶ 40).

³⁹ *See infra* Sections II.D.1.

⁴⁰ *See supra* Section II.A.

Second, the V-COMM Study measured the performance of actual Band Class 12 devices that were not commercially available at the time of the Lower A Block Study.⁴¹ V-COMM's use of commercially available Band Class 12 devices not only confirmed the Lower A Block Study's finding that Channel 51 and high-powered E Block transmissions were immaterial to 700 MHz device performance, regardless of the type of filter used, but it further refuted AT&T's claim that the Lower A Block Study results were unreliable on that basis.⁴²

Finally, the values in the V-COMM Study were calculated in areas of close proximity to the Channel 51 station. These measurements closer to the DTV transmission sites invalidate AT&T's claim that the Lower A Block Study did not adequately measure Channel 51 field strength.⁴³ Again, V-COMM's actual observation of DTV signal patterns confirmed what the Lower A Block Study conclusively demonstrated: that Channel 51 transmitters would not direct their signals directly to the ground. This result further invalidates AT&T's claim that the Lower A Block Study did not adequately measure Channel 51 field strength.⁴⁴

The V-COMM Study offers independent and conclusive validation of the Lower A Block Study results. Indeed, those two studies are the *only* reliable engineering tests that examine real world situations, with reasonable assumptions and analysis addressing the technical issues raised in this proceeding. As there is nothing in the record to refute these real world results, the available evidence establishes that Channel 51 and high-powered E Block transmissions do not pose any threat of harmful interference to Lower B and C Block device reception, and that Band Class 12 is adequate to protect signal reception across the Lower 700 MHz band.

⁴¹ See *V-COMM Study Report* at 2.

⁴² See *infra* Section II.D.2.

⁴³ See *infra* Section II.D.4.

⁴⁴ See *V-COMM Study Report* at 30.

C. There Is Widespread Agreement That the Lower A Block Study Conclusively Demonstrated That Restoring Interoperability Will Not Adversely Impact Lower B and C Block Device Reception.

The initial round of comments in this proceeding also reflect general agreement that the Lower A Block Study conclusively demonstrated that a unified Lower 700 MHz band class would not result in harmful interference to device reception in the Lower B and C Blocks.⁴⁵ These lab and field tests confirmed that neither Channel 51 broadcast operations, nor high-powered D and E Block transmissions present a threat of interference to B and C Block device reception, and do not warrant multiple, disparate technical standards in the Lower 700 MHz band. The Lower A Block Study findings, together with other considerations, refute the only justifications that AT&T and its equipment vendors have ever put forth in defense of Band Class 17, as follows:

(1) **Alleged Channel 51 Interference:** The risk that Channel 51 transmissions may cause harmful interference to Lower B and C Block device reception lacks merit.

- a. Because the final device specifications adopted for Band Class 17 are identical to those of Band Class 12, both band classes treat Channel 51 transmissions the same way. As such, the use of another component in a Band Class 17 device to address potential Channel 51 interference concerns could be utilized to the same effect in a Band Class 12 device.
- b. Even if the Band Class 17 and Band Class 12 device specifications were different, Channel 51 operations, even at excessive levels, would not cause reverse PA IM interference to Lower B and C Block device reception.
- c. The circumstances necessary for reverse Channel 51 transmissions to cause PA IM interference to the Lower B and C Blocks are extremely unlikely.

(2) **Alleged Lower D Block Interference:** The risk that high powered D Block transmissions may cause harmful interference to Lower B and C Block device reception lacks merit.

- a. Because the device specifications for Band Class 17 are identical to those of Band Class 12, both band classes treat Lower D Block transmissions the same way. As such, the use of another component in a Band Class 17

⁴⁵ See Vulcan Comments at 11-17; U.S. Cellular Comments at 6; T-Mobile Comments at 14-16; NTCA Comments at 8; King Street Comments at 13; Cavalier & Continuum Comments at 10; Cricket Comments at 6; Cellular South Comments at 10; RTG Comments at 14.

device to address potential Lower D Block interference concerns could be utilized to the same effect in a Band Class 12 device.

- b. AT&T now holds all of the licenses to the Lower D Block spectrum, and the FCC has imposed conditions on the transmission levels in the Lower D Block to mitigate the risk of harmful interference to Lower A, B, and C Block base station reception.

(3) **Alleged Lower E Block Interference:** The risk that high powered E Block transmissions may cause harmful interference to Lower B and C Block device reception lacks merit.

- a. Band Class 12 devices would adequately protect Lower B and C Block users from high power E Block transmissions.
- b. Commercially available LTE devices are already capable of receiving and managing neighboring signal levels far greater than that which might result from out-of-block signals under a unified Lower 700 MHz band class.
- c. AT&T holds the Lower E Block licenses in five major U.S. markets, covering a population of approximately 22% of the United States (70 million people), all of which are subject to FCC-imposed power limitations that eliminate the risk of interference to Lower B and C Block device reception in those markets.

A number of commenting parties—including many which were not members of the Lower A Block consortium—agree that the Lower A Block Study provides valid and compelling evidence that Band Class 17 has no value. For example, the Rural Telecommunications Group described the Lower A Block Study as constituting “exhaustive real world engineering tests that [demonstrate] the interference issues advanced by the opponents of a Band Class 12 mandate are at worst overstated, and more than likely, non-existent,”⁴⁶ and further concluded that “[t]he theoretical presence of interference in the Lower 700 MHz Band . . . is likely non-existent when based on real world testing.”⁴⁷ Cricket Communications similarly noted that the Lower A Block Study “demonstrate[s] . . . that the use of Band Class 12 devices in the Lower 700 MHz B and C

⁴⁶ RTG Comments at 14.

⁴⁷ *Id.* at 13.

Blocks would not degrade or impair service in these frequencies, as AT&T and other Band Class 17 operators have alleged.”⁴⁸ Likewise, according to T-Mobile, the Lower A Block Study results “confirm that interference from television Channel 51 to Band Class 12 stations can be managed and that handsets are not affected by Channel 51 operations,”⁴⁹ and “show that a Band Class 12 device operating in the Lower 700 MHz B and C Blocks would tolerate a Lower E Block signal better than a device operating in the Lower A Block.”⁵⁰

D. The Objections to the Lower A Block Study Are Unsubstantiated and Meritless.

The Commission should disregard the unsubstantiated objections that AT&T and Qualcomm have made to the Lower A Block Study results. Such objections not only consist of misleading critiques, theoretical rebuttals, and incomplete analysis intended to obscure the significance of the Lower A Block Study results, they are belied by the results of the Lower A Block Study and V-COMM Study, which effectively and conclusively unravel the justifications for Band Class 17. Moreover, AT&T’s objections were made in lieu of conducting its own testing and analysis of whether a unified Lower 700 MHz band will impair B and C Block devices, despite the Commission’s request that commenting parties support their technical assertions with data.⁵¹ Each critique offered by AT&T and Qualcomm fails to undermine the Lower A Block Study.

⁴⁸ Cricket Comments at 6.

⁴⁹ T-Mobile Comments at 14.

⁵⁰ *Id.* at 17.

⁵¹ *See supra* Section II.A.

1. Baseless Objection #1: There is no “real world” experiment available that can demonstrate how an interoperable Lower 700 MHz band may impact Lower B and C Block device reception.⁵²

The Commission should reject AT&T’s fatalistic and conclusory assertion that there is no “real world” experiment or other means by which the FCC (or any other party) can determine whether and how restoring interoperability in the Lower 700 MHz band may impact B and C Block device reception, and that “textbook physics and engineering principles” (applied in a selective and misleading manner) are alone sufficient to demonstrate that Band Class 12 will not adequately protect B and C Block devices.⁵³ Such an assertion is plainly contradicted by reality: the engineering tests and analyses offered by Vulcan and other Lower A Block licensees establish the feasibility of conducting an experiment—under realistic conditions, with commercially available devices, with actual transmission measurements, and with reasonable technical assumptions—to determine whether out-of-block signals may impact device reception across the Lower 700 MHz band. Likewise, the V-COMM Study confirmed the Lower A Block Study findings and provided further evidence that “real world” studies are in fact available to assess the effects of a unified Lower 700 MHz band.⁵⁴

2. Baseless Objection #2: The Lower A Block Study did not include or test Band 12 devices.⁵⁵

The Commission should likewise disregard AT&T’s claim that the Lower A Block Study is unreliable because it did not directly test Band Class 12 devices. By raising this objection,

⁵² AT&T Comments at 27.

⁵³ *Id.* at 28-29.

⁵⁴ Moreover, AT&T’s assertion is contradicted by the prevalence of interoperability in the marketplace. As the Commission knows, interoperability within a wireless band class has been the longstanding norm, and that the Lower 700 MHz band “is the only non-interoperable commercial mobile service band.” *NPRM* ¶ 2. Thus, regardless of whether a party can devise lab and field tests in this case, the “real world” already demonstrates the viability of interoperable band classes and the feasibility of designing devices capable of operating in such an environment.

⁵⁵ AT&T Comments at 36.

AT&T unwittingly illuminates one of the principal costs of non-interoperability in the Lower 700 MHz band: as other commenters have explained, testing of commercially available Band Class 12 devices was not possible because, due to the lack of interoperability in the Lower 700 MHz band, no such devices existed in the marketplace at the time the Lower A Block Study was performed (and very few now exist in the marketplace).⁵⁶

This objection is also moot in light of the results from the V-COMM Study. As discussed above, in arriving at the same conclusions as the Lower A Block Study, the V-COMM Study used “actual Band Class 12 devices that were not available at the time that the” Lower A Block Study was performed.⁵⁷

Finally, even if Band Class 12 devices had been commercially available, the Lower A Block Study was designed and conducted in such a manner that it was unnecessary to employ actual Band Class 12 devices. The lab tests in the Lower A Block Study revealed that commercially available mobile devices already offer sufficient protection from Channel 51 and Lower E Block transmissions, *regardless of the type of filter employed*.⁵⁸

3. Baseless Objection #3: The Lower A Block Study asked the wrong question by addressing whether out-of-block interference will adversely impact B or C Block devices, when the relevant question concerns the relative performance of Band 17 and Band 12 devices in the presence of Channel 51 and E block interference.⁵⁹

The Commission should also disregard AT&T’s preposterous assertion that the Lower A Block Study addresses the wrong issue. Such a claim is nothing more than an attempt by AT&T to obfuscate the issue at hand and dissuade the Commission from paying any mind to the feeble

⁵⁶ See, e.g., King Street Comments at 14.

⁵⁷ V-COMM Study Report at 1; see *supra* Section II.B.

⁵⁸ See Ex Parte Letter from Michele C. Farquhar, Counsel to Vulcan Wireless, to Marlene H. Dortch, Secretary, FCC, Attachment 2 at 4 (Dec. 12, 2011) (“Vulcan Dec. 12 Ex Parte”).

⁵⁹ AT&T Comments at 36.

reasoning that AT&T used during the 3GPP deliberations to concoct Band Class 17.⁶⁰ In fact, the question before the FCC in this proceeding *is* the very question that the Lower A Block Study examined—whether there exists a threat of harmful interference from Channel 51 and high-powered E Block transmissions that necessitates the need for Band Class 17. It is not, as AT&T argues, a question of the relative performance of Band Class 17 filters and Band Class 12 filters.

As Vulcan has explained to the Commission, AT&T (and its equipment vendors) succeeded in establishing Band Class 17 by claiming, without support, that Channel 51, D Block, and E Block transmissions will cause harmful interference to Band Class 12 devices operating on the B and C Blocks. Consequently, the Lower A Block Study was designed and conducted to test the validity of that claim, and conclusively rebutted it. Rather than confront the indisputable findings of the Lower A Block Study, however, AT&T has invoked muted references to “textbook physics” and “basic principles” of engineering, while asserting that the question of whether out-of-band transmissions will cause interference to Band Class 12 device reception has no bearing on this proceeding, when it is in fact the only justification AT&T used to convince 3GPP to establish Band Class 17, and therefore the most relevant question before the Commission. Accordingly, the Commission should disregard AT&T’s circular argument that the Commission need only compare the filter performance of Band Class 17 and Band Class 12 to confirm the necessity of Band Class 17. That is not, and never has been, a relevant question in this proceeding.

⁶⁰ AT&T’s conduct in this regard calls to mind the unscrupulous tailors in Hans Christian Andersen’s fable, *The Emperor’s New Clothes*. After weaving a suit of invisible cloth (*i.e.*, a claim that out-of-block emissions will harm B and C Block devices using Band Class 12), AT&T implores the Commission to consider only the quality of fabric (*i.e.*, the comparative filter performance of Band Class 12 and Band Class 17), rather than acknowledge that the Emperor in fact has no clothes (*i.e.*, the reality that out-of-block emissions will not harm B and C Block devices using Band Class 12). The Commission should disregard such sleight of hand, which functions only to distort the fundamental issue in this proceeding. *See* Hans Christian Andersen, *The Emperor’s New Clothes* (1837).

4. Baseless Objection #4: The Lower A Block Study suffers from various technical flaws.

As set forth in Part C of Exhibit 1 to these reply comments, the assertions made by AT&T and Qualcomm that the Lower A Block Study suffers from various technical flaws are unsubstantiated and invalid. As an initial matter, neither party offered any data or measurements to support their claims. In fact, no such data exist, as made evident by the Lower A Block Study and confirmed by the V-COMM Study.

Furthermore, the objections to the Lower A Block Study are incorrect, immaterial, misleading, or irrelevant. For example, AT&T mistakenly asserted that the Lower A Block Study assumed that Channel 51 intermodulation would be a problem only where AT&T is operating in both the B and C Blocks, and focused on off-center transmissions that understated the actual impact of Channel 51 interference.⁶¹ However, AT&T's claim to that effect manifests a fundamental misunderstanding of the Lower A Block Study, which did not make that conclusion or focus exclusively on off-center transmissions. Rather, the Lower A Block Study was designed to identify configurations in the real world that could possibly result in interference within the B or C Block spectrum bands. The data revealed that a 10 MHz LTE channel (across the B and C Blocks) was necessary for the device to experience any overlap with the receive frequencies, and that this occurrence was highly unlikely in any event. AT&T distorts this important conclusion, either because it misunderstands the analysis or simply does not want the Commission to recognize its significance.

Likewise, AT&T claimed that the Lower A Block Study is based on an insufficient sample of field measurements that were too far away from transmitters to provide relevant information.⁶² This objection is meaningless as a practical matter. As Vulcan has previously explained, the

⁶¹ AT&T Comments at 36.

⁶² AT&T Comments at 36; Qualcomm Comments at 55.

strongest degree of potential interference would not be directly underneath the Channel 51 transmitter, and rarely within 12 square kilometers of it.⁶³ Rather, to cover large areas (as a DTV transmission system is designed to do), the system would employ antennas with high elevation pointed towards the horizon. Directing the antenna of these systems to transmit to the ground is neither optimal nor practical. The V-COMM Study, which observed actual DTV antenna patterns, confirmed that Channel 51 broadcast systems do not direct energy to the ground (but rather to the horizon),⁶⁴ although it nevertheless obtained measurements in close proximity to Channel 51 transmitters to address and rebut AT&T's objection on this basis.⁶⁵ Additionally, this objection by AT&T simply ignored the fact that some measurements in the Lower A Block Study were conducted within 50 feet of the base transmitter at an LPTV site.

III. THERE IS WIDESPREAD AGREEMENT THAT RESTORING INTEROPERABILITY IN THE LOWER 700 MHZ BAND WOULD YIELD ENORMOUS PUBLIC INTEREST BENEFITS.

A. Restoring Lower 700 MHz Interoperability Would Benefit Consumers By Resulting in a More Robust Equipment Market and Carrier Competition.

The record established in the initial round of this proceeding leaves no doubt that restoring Lower 700 MHz interoperability would provide numerous, far-reaching benefits to consumers and the public interest. Most commenters agreed “that a unified band class across the Lower 700 MHz band has the potential to yield significant benefits for all licensees.”⁶⁶ Those benefits, in turn, would empower U.S. consumers in a number of ways, and provide a substantial boost to mobile

⁶³ See *Vulcan Dec. 12 Ex Parte*, Attachment 2 at 1.

⁶⁴ *V-COMM Study Report* at 11.

⁶⁵ See *id.* at 28.

⁶⁶ *NPRM* ¶ 4.

broadband proliferation by eliminating an artificial barrier to deployment, in furtherance of one of the Commission's most important policy goals.⁶⁷

1. Restoring Interoperability Would Result in Greater Consumer Choice.

Multiple commenters agreed that restoring Lower 700 MHz interoperability would promote consumer choice of mobile devices, stimulate innovation in the development of advanced mobile devices, and result in economies of scale and scope in the commercial equipment market that will lower prices for consumers.⁶⁸ Cricket, for example, explained that “[u]nifying Band Class 12 and Band Class 17 will increase demand for devices capable of operating on the unified band class, thereby increasing the incentives for manufacturers to develop a wide range of devices.”⁶⁹ Several commenters echoed this sentiment, adding that increased demand for a wider range of devices would “encourage mobile innovation,”⁷⁰ provide consumers “with a greater choice of higher quality mobile devices,”⁷¹ and would “help to ensure availability of the most advanced technology to both large and small carriers.”⁷²

2. Restoring Interoperability Would Result in Lower Prices for Devices and Mobile Broadband Service.

Restoring interoperability would not only provide consumers with greater choice of advanced and innovative devices, it would result in lower prices for such devices. That is because

⁶⁷ See Statement of Julius Genachowski, Chairman, Federal Communications Commission, Hearing Before the Subcommittee on Communications and Technology of the United States House of Representatives, Oversight of the Federal Communications Commission (July 10, 2012) (“*Genachowski 2012 Committee Remarks*”).

⁶⁸ See T-Mobile Comments at 6-7; Cricket Comments at 6-10; Cavalier and Continuum Comments at 5-7; Comments of RCA – The Competitive Carriers Association, WT Docket No. 12-69, at 9-10 (June 1, 2012) (“*RCA Comments*”).

⁶⁹ See Cricket Comments at 7.

⁷⁰ RCA Comments at 10.

⁷¹ T-Mobile Comments at 7.

⁷² Cavalier and Continuum Comments at 6.

the increased demand for devices that operate in an interoperable Lower 700 MHz band and the resulting expansion of the device ecosystem would “generate the economies of scale that allow the design costs and other manufacturing costs to be spread over a larger volume of devices, resulting in lower per unit costs.”⁷³ T-Mobile explained that restoring interoperability “would promote economies of scale and scope and alleviate inequities among 700 MHz licensees by enabling the formation of a robust device market serving all 700 MHz licensees.”⁷⁴ Other commenters amplified these conclusions, demonstrating that Lower 700 MHz interoperability would “reduce the cost of devices for consumers and for public safety,”⁷⁵ and that it would “drastically reduce the cost of devices and make them more accessible to a greater number of American consumers.”⁷⁶

Additionally, by enhancing marketplace competition, restoring interoperability would yield lower costs for mobile broadband service. In assessing the public interest benefits that would follow from a reconstituted Lower 700 MHz band class, Vulcan urges the Commission to take into account not just the marginal cost of producing Band Class 12 handsets, but rather the entire cost that consumers pay for mobile broadband service. Even if, as AT&T and its device makers asserted, restoring interoperability would result in a small increase to the cost of Lower 700 MHz devices (a point that Vulcan and others dispute, and which the evidence strongly rebuts⁷⁷), that is but a fraction of the full cost consideration. Rather, the “total cost” of mobile broadband service—in a non-interoperable environment—includes the price of the handset, as well as the cost of the service plan in a marketplace marred by limited choice, weak competition, and diminished innovation (all direct results of a disjointed Lower 700 MHz band). When these considerations are

⁷³ Cricket Comments at 7.

⁷⁴ T-Mobile Comments at 7.

⁷⁵ RCA Comments at 10.

⁷⁶ RTG Comments at 6.

⁷⁷ See *infra* Section IV.

taken into account, the economics strongly militate in favor of restoring interoperability, as the total mobile broadband cost borne by consumers will remain artificially high absent the more competitive wireless ecosystem that would emerge with an interoperability solution.

For example, AT&T requires its smartphone customers to purchase a data plan. A two-year data plan offered by AT&T that costs \$30 per month would yield a data service plan cost of at least \$720.⁷⁸ The cost of a next-generation handset, at approximately \$200, is just 22 percent of the consumer's total \$920 two-year investment in mobile broadband service. This percentage is likely to fall precipitously given that service fees are likely to escalate as the nation's largest wireless carriers (including Verizon and AT&T) migrate from unlimited to tiered data plans,⁷⁹ while the average costs of mobile devices are expected to continue to fall.⁸⁰ AT&T has already taken aggressive steps in this area by effectively ending its unlimited data plan offerings and informing customers that AT&T will throttle their network speeds if they exceed the new monthly usage cap.⁸¹ As non-interoperability limits the ability of subscribers with Band Class 17 devices to switch to competing carriers offering service on Lower A Block spectrum (without purchasing another, and more expensive, mobile device using Band Class 12), the principal cost of a

⁷⁸ See AT&T Smartphones and Mobile Devices, at <http://www.att.com/shop/wireless/devices/smartphones.html>.

⁷⁹ See Editorial, *Prices Up for Data Download*, Los Angeles Times, June 18, 2012, available at <http://www.latimes.com/news/opinion/editorials/la-ed-verizon-wireless-data-prices-20120614,0,1549700.story>; see also Phil Goldstein, *AT&T's Stephenson: Verizon's Shared Data Pricing 'Not a Surprise'*, FierceWireless, June 12, 2012, at <http://www.fiercewireless.com/story/atts-stephenson-verizons-shared-data-pricing-not-surprise/2012-06-12>.

⁸⁰ See Pascal-Emmanuel Gobry, *Analyst: Smartphone Sales Will Dwarf PC Sales This Year and Reach a Staggering 1.5 Billion Per Year by 2016*, Business Insider, Feb. 29, 2012, at http://articles.businessinsider.com/2012-02-29/tech/31109577_1_smartphones-pc-sales-internet (citing research firm BI Intelligence as predicting that the average cost of smartphones to drop to \$200, from \$315, within the next few years); see also Press Release, ABI Research, *In 2009, 27% of Smartphones Cost Under \$200, ABI Research Finds*, Oct. 29, 2009 (forecasting that 45% of smartphones shipped in 2014 will be priced below \$200). For example, with a \$50 data plan and a \$150 handset, the device cost would constitute approximately 11 percent over a two-year period.

⁸¹ See Greg Bensinger, *AT&T Ends All-You-Can-Eat*, Wall Street Journal, Mar. 1, 2012, available at <http://online.wsj.com/article/SB10001424052970203986604577255532947217336.html>.

disjointed Lower 700 MHz is captured in the service plan fees. Given the enormous quantity of Band Class 17 smartphone devices that AT&T is selling each year,⁸² the total cost of non-interoperability borne by consumers dwarfs any device-related costs that may be incurred to restore a unified Lower 700 MHz band class.

3. Restoring Interoperability Would Reduce Switching Costs For Consumers.

Restoring interoperability would also reduce switching costs for consumers.⁸³ Interoperability within each commercial mobile band has been central to the ability of consumers to choose among mobile devices, services, and rates, with the security of knowing that their chosen technology will function across multiple networks and platforms anywhere in the country. However, as the cornerstone of interoperability has been erased in the Lower 700 MHz band, consumers no longer have this ability or security. Rather, the unanticipated development of Band Class 17 has reduced competition in the U.S. wireless industry, further empowered the two dominant wireless carriers in the United States,⁸⁴ and crippled small, regional, and greenfield wireless operators that are essential to robust competition and consumer welfare. Moreover, the lack of interoperability has substantially harmed consumers by limiting not only their competitive choices, but also the functionality and long-term viability of their devices.

Other commenters agreed that restoring interoperability would empower consumers in their ability to switch service providers. As the public interest group commenters observed, the

⁸² In the fourth quarter of 2011, AT&T sold 9.4 million smartphones, nearly double that in the third quarter of 2011. Press Release, AT&T, *Best-Ever Mobile Broadband Sales and Strong Cash Flows Highlight AT&T's Fourth-Quarter Results*, Jan. 26, 2012, available at <http://www.att.com/gen/press-room?pid=22304&cdvn=news&newsarticleid=33762&mapcode=corporate|financial>.

⁸³ See Vulcan Comments at 33 (citing *NPRM* ¶ 17).

⁸⁴ See 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; *Fifteenth Report*, WT Docket No. 10-133, FCC 11-103 (rel. June 27, 2011) (declining to find that the CMRS marketplace is subject to effective competition).

Commission has concluded that “replacing a handset when switching providers is an economic switching cost for consumers,” and that such costs are “a barrier to competition” because they reduce consumer choice.⁸⁵ RTG similarly explained that an interoperable Lower 700 MHz band would give a consumer purchasing a Band Class 12 device “greater flexibility to then use that same device on the network of a competing service provider if the customer decides to switch providers,” making it easier for a consumer to “walk away” if the current service provider’s quality (or cost) of service is unacceptable.⁸⁶ This concern is increasingly relevant given the proliferation in the variety of wireless devices owned by consumers, as owning multiple devices that are tethered to a single provider may make a consumer’s potential switching costs so high as to effectively eliminate the opportunity to “walk away.” It is critical, therefore, that consumer choice not be left in the wake of the expanding mobile device ecosystem due to excessive and avoidable switching costs. Lower 700 MHz interoperability would help ensure this does not occur by empowering consumers and removing artificial limitations that currently preclude them from using their mobile devices across the Lower 700 MHz band.⁸⁷

While restored interoperability in the Lower 700 MHz band would benefit all consumers, those in rural and unserved areas stand to gain the most. The Commission recognized in the NPRM that “a significant number of Lower A Block licenses are held by smaller, rural, and regional licensees.”⁸⁸ U.S. Cellular noted that this fact, combined with the excellent propagation

⁸⁵ Comments of Consumers Union, Public Knowledge, New America Foundation, and Free Press, WT Docket No. 12-69, at 7-8 (June 1, 2012) (“Public Interest Group Comments”).

⁸⁶ RTG Comments at 9.

⁸⁷ See, e.g., Public Interest Group Comments at 12-13 (describing constraints on consumer choice of devices without interoperability, and concluding that “this would have the same practical effect in the marketplace as the device “locking” and “blocking” tactics that the Commission sought to avoid with the C Block license conditions”).

⁸⁸ NPRM ¶ 22 (noting that the 700 MHz A Block licensees include Vulcan, U.S. Cellular, King Street Wireless, Rural Cellular Corp., PVT, NTUA Wireless, MetroPCS, Cox Wireless, Continuum 700, CenturyTel, Cellular South, Cavalier Wireless, Alltel Communications (Verizon Wireless), and Triad 700).

characteristics of the 700 MHz bands, provide a unique “opportunity to address [the] lack of rural broadband coverage” and “to promote the provision of innovative services to consumers . . . including in rural areas” through restoration of Lower 700 MHz interoperability.⁸⁹ Other commenters agreed, observing that interoperability would speed “deployment of advanced broadband services in [rural] areas” by providing more access to equipment for A Block licensees,⁹⁰ increase “broadband coverage to more than one-third of the U.S. geography and almost 9 percent of the American population,”⁹¹ and make devices cheaper and more accessible “to a greater number of American consumers, particularly those living, working and traveling in rural markets.”⁹²

4. Restoring Interoperability Would Facilitate Roaming Agreements.

A reconstituted Lower 700 MHz band also would benefit consumers by facilitating the execution of nationwide roaming agreements, and would prohibit incumbent carriers from circumventing the Commission’s voice and data roaming orders on the basis that roaming is technically infeasible across the Lower A Block.⁹³ As U.S. Cellular noted, such agreements are “essential” because the small and regional Lower 700 MHz A Block licensees “are dependent upon roaming agreements for the provision of seamless communications.”⁹⁴

⁸⁹ U.S. Cellular Comments at 12 (internal quotation marks omitted).

⁹⁰ T-Mobile Comments at 7.

⁹¹ RCA Comments at 11.

⁹² RTG Comments at 6.

⁹³ See Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 05-265, FCC 07-143 (rel. Aug. 16, 2007); Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services, *Order on Reconsideration and Second Further Notice of Proposed Rulemaking*, WT Docket No. 05-265, FCC 10-59 (rel. Apr. 21, 2010); Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services, *Second Report and Order*, WT Docket No. 05-265, FCC 11-52 (rel. Apr. 7, 2011).

⁹⁴ U.S. Cellular Comments at 16 (internal quotation marks omitted).

In its initial comments, Vulcan explained that restoring interoperability could facilitate roaming agreements and benefit consumers by promoting: (1) connectivity for, and nationwide access to, communications services; (2) innovation and investment in mobile broadband networks; (3) the development of competitive service offerings; (4) seamless mobile service throughout the country; and (5) consistent coverage and service quality.⁹⁵ Other commenters agreed that interoperability would allow consumers to take advantage of these benefits by “promot[ing] reasonable roaming arrangements among 700 MHz providers and increas[ing] the number of providers that are technologically compatible for roaming partnership,”⁹⁶ giving “carriers outside the 700 MHz band . . . more options for potential roaming partners inside the 700 MHz band” by creating a single Lower 700 MHz band class,⁹⁷ and by ensuring that current “[c]ustomers of Block B and Block C service providers” are able to roam “on comparable LTE networks operated by Block A licensees when those subscribers are outside their home market.”⁹⁸ NTCA, for example, explained that restoring interoperability would tear down “an artificial barrier” that “stands between the spectrum bands” and prevents the customers of large carriers from utilizing the 700 MHz systems of small and regional carriers, and further prevents the customers of small carriers from roaming beyond their local networks on the networks of large carriers.⁹⁹

While AT&T insists that other avenues exist for A Block licensees to enter into roaming agreements, it concedes that many of these purported avenues depend on speculative technological innovations or market changes.¹⁰⁰ Still other purported avenues presuppose the existence of

⁹⁵ Vulcan Comments at 26-27.

⁹⁶ Comments of Horry Telephone Cooperative, WT Docket No. 12-69, at 5 (June 1, 2012) (“Horry Comments”).

⁹⁷ T-Mobile Comments at 9.

⁹⁸ RTG Comments at 9-10.

⁹⁹ NTCA Comments at 7.

¹⁰⁰ See AT&T Comments at 17-19.

market power and the ability to entice device makers that Lower A Block licensees lack because of AT&T's effort to bifurcate the Lower 700 MHz band.¹⁰¹ In the final analysis, AT&T simply cannot point to any compelling reason for the Commission to maintain an “artificial barrier” that stacks the deck against Lower A Block licensees seeking roaming agreements, particularly when removing that barrier would provide immediate public interest and consumer benefits.

Given the absence of valid technical concerns (as detailed above), the overriding reason why AT&T resists Lower 700 MHz interoperability may be to avoid the vibrant competition that it would bring to the mobile market. That is, of course, contrary to the Commission's mandate and the Telecommunications Act of 1996. As the Horry Telephone Cooperative explained, “[a] major goal of the [Act] was to let any communications business compete in any market against any other” by removing “the legal and economic obstacles that have frustrated competition for too long.”¹⁰²

In this proceeding, to assess the legal and economic obstacles to competition, the Commission must consider the “entry and exit conditions” that are “relevant for determining *if* actual entry or exit will occur, and *when* actual entry or exit will occur – both of which are important for ensuring competition in the marketplace.”¹⁰³ Restoring Lower 700 MHz interoperability would ensure that actual entry by smaller and rural providers is feasible, by giving them access to the “newest, most efficient and most attractive devices” necessary to compete with dominant, national providers, and would facilitate earlier entry for such licensees seeking to

¹⁰¹ See *id.* at 16-17.

¹⁰² See Horry Comments at 6 (quoting Reed Hundt, Chairman, FCC, Network Reliability Comforum, Washington, DC 1996 FCC LEXIS 1997 (1996)).

¹⁰³ Public Interest Group Comments at 11.

establish the footholds necessary to compete with larger providers.¹⁰⁴ Increased competition from small, rural, and regional Lower 700 MHz licensees, in turn, would lead to obvious public and consumer benefits.

B. Restoring Lower 700 MHz Interoperability Would Advance the Commission’s Spectrum Goals.

Not only would restoring Lower 700 MHz interoperability serve the public interest and result in numerous consumer benefits, it also would advance the Commission’s “longstanding interest in promoting the interoperability of mobile user equipment in a variety of contexts as a means to . . . ensure the most efficient use of spectrum.”¹⁰⁵ Because of the acknowledged spectrum shortage in the United States, the Commission has pursued, and continues to pursue, multiple avenues to make more spectrum available for commercial use, including by reclaiming government spectrum, modifying receiver standards, reclaiming TV spectrum through an incentive auction, exploring spectrum sharing strategies, investigating cognitive radios, promoting secondary markets for spectrum, and encouraging greater spectrum efficiency.

The Commissioners have acknowledged the dire need for regulatory actions aimed at maximizing spectrum efficiency. For example, Commissioner Pai recently noted the imperative to “allocate and encourage the efficient use of any and all bands that can be utilized by commercial wireless broadband services.”¹⁰⁶ Likewise, Commissioner McDowell emphasized the need for

¹⁰⁴ *Id.*; Comments of the Blooston Rural Carriers, WT Docket No. 12-69, 6-8 (June 1, 2012) (“Blooston Comments”).

¹⁰⁵ U.S. Cellular Comments at 11; *see also* Cavalier & Continuum Comments at 14 (noting that “facilitat[ing] interoperability” is synonymous with the “efficient use of 700 MHz spectrum”).

¹⁰⁶ Statement of Ajit Pai, Commissioner, Federal Communications Commission, Hearing Before the Subcommittee on Communications and Technology of the United States House of Representatives, Oversight of the Federal Communications Commission (July 10, 2012).

governmental policies that will promote “accelerated improvements in spectral efficiency,”¹⁰⁷ while Commissioner Rosenworcel has proclaimed that now “is the time to innovate” and to “put American know-how to work and create incentives to invest in technologies . . . that multiply the capacity of our airwaves.”¹⁰⁸ As Cricket noted in this proceeding, the time to make additional spectrum available to the marketplace is now.¹⁰⁹ Given that mobile data usage continues its “sharp upward trajectory,” “the Commission [must] seize all opportunities to unleash spectrum for mobile broadband use, promote efficient operations on that spectrum, and ensure that consumers using that spectrum enjoy seamless connectivity.”¹¹⁰

Restoring interoperability in the Lower 700 MHz band offers an accessible, inexpensive, and prompt means through which the Commission can “free up much-needed usable low-band spectrum”¹¹¹ and “promote maximum spectrum utility.”¹¹² By contrast, the exclusive Band Class 17 endorsed by AT&T and Qualcomm would continue to flout the Commission’s spectrum-related goals, by restricting some of the most valuable spectrum available, limiting the ability of licensees to roam and access spectrum in the Lower 700 MHz band, and stifling the development of advanced mobile devices for the band. In short, by restoring interoperability to the Lower 700 MHz band, the Commission will enable a more productive and efficient use of the limited supply of spectrum suitable for mobile broadband service.

¹⁰⁷ Statement of Robert M. McDowell, Commissioner, Federal Communications Commission, Hearing Before the Subcommittee on Communications and Technology of the United States House of Representatives, Oversight of the Federal Communications Commission (July 10, 2012).

¹⁰⁸ Statement of Jessica Rosenworcel, Commissioner, Federal Communications Commission, Hearing Before the Subcommittee on Communications and Technology of the United States House of Representatives, Oversight of the Federal Communications Commission (July 10, 2012).

¹⁰⁹ Cricket Comments at 2.

¹¹⁰ *Id.*

¹¹¹ RCA Comments at 10-11.

¹¹² MetroPCS Comments at 7.

C. Restoring Lower 700 MHz Interoperability Would Provide a Boost to the Economy.

Restoring interoperability to the Lower 700 MHz band would not only benefit consumers and Lower 700 MHz band licensees, but also the economy at large. As Chairman Genachowski recently noted, the expanding wireless broadband service helps “grow [the U.S.] economy, create jobs, enhance U.S. competitiveness, and foster improvements in areas like education, health care, and public safety.”¹¹³ Additionally, the Chairman has touted the vast economic value that is generated through FCC auctions, which is estimated to be approximately 10 times the value garnered at auction.¹¹⁴ By restoring interoperability, the Commission can adopt substantial measures to harness the economic value that, through unforeseeable circumstances caused by market failure, has been dormant in the Lower 700 MHz band.

In its initial comments, Vulcan noted that restoring interoperability would provide a boost to the economy by promoting investment, facilitating innovation, and stimulating job creation.¹¹⁵ Other commenters identified similar economic benefits, as RCA noted that interoperability “would foster economic recovery,” “stimulate job growth,” “generate higher auction revenue,” and “reduce government spending while increasing revenues at federal, state, and local levels.”¹¹⁶ These general economic benefits provide further support for Commission action to reconstitute a unified Lower 700 MHz band.

¹¹³ *Genachowski 2012 Committee Remarks*.

¹¹⁴ Statement of Chairman Julius Genachowski, Federal Communications Commission, Hearing on the FCC’s Fiscal 2013 Budget Request Before the Subcommittee on Financial Services and General Government, Committee on Appropriations, U.S. House of Representatives (Mar. 19, 2012) (“*Genachowski 2012 House Statement*”), available at http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0319/DOC-313081A1.pdf.

¹¹⁵ Vulcan Comments at 42.

¹¹⁶ RCA Comments at 10.

IV. AN INTEROPERABILITY SOLUTION CAN BE IMPLEMENTED PROMPTLY WITH MINIMAL COST TO LOWER 700 MHZ LICENSEES, VENDORS, AND CONSUMERS.

A. Restoring Lower 700 MHz Interoperability Is Feasible and Can Be Achieved at Minimal Cost.

Restoring interoperability in the Lower 700 MHz band can be implemented quickly, without material disruption to service, and at no material cost to licensees, device makers, and consumers.¹¹⁷ As noted by the Blooston Rural Carriers, “the record that has been developed over the past two-and-a-half years” establishes that “there are no longer any significant technical barriers to having full Lower 700 MHz band interoperability.”¹¹⁸ Other commenters agreed that restoring interoperability would “not be technically burdensome or result in delay,”¹¹⁹ would not “require substantial network upgrades or modifications,” and “can be phased in with minimal burdens on carriers currently operating only on Band Class 17.”¹²⁰ Indeed, most of the transition, on base stations and devices alike, could be accomplished through remote and routine software upgrades, without any risk of service disruption, delay, or degradation.¹²¹ Accordingly, the majority of parties in this proceeding agree that Commission should disregard the unsubstantiated claims that restoring interoperability across the band would adversely impact device form factors, battery life, and cost.¹²²

In assessing the viability of restoring interoperability, the Commission should not simply measure the marginal costs that may be incurred to configure and accommodate mobile base

¹¹⁷ See Vulcan Comments at 36-42.

¹¹⁸ Blooston Rural Carriers Comments at 2-3.

¹¹⁹ T-Mobile Comments at 19.

¹²⁰ Cricket Comments at 9.

¹²¹ Vulcan Comments at 37.

¹²² AT&T Comments, Exhibit A at 10; Comments of the Consumer Electronics Association, WT Docket No. 12-69, at 6 (June 1, 2012) (“CEA Comments”); Comments of Research in Motion Corporation, WT Docket No. 12-69, at 7 (June 1, 2012) (“RIM Comments”).

stations and handsets. Rather, it should also take into account the “total cost” of mobile broadband service in a non-interoperable environment. As described above, the costs of non-interoperability—which include the elevated price of handsets and devices, artificially inflated service plan rates, limited choice, minimal competition, and diminished innovation—far outweigh any practical costs necessary to restore interoperability across the Lower 700 MHz band.¹²³ Moreover, these costs are concentrated in the service plan fees that consumers must pay on a monthly basis, and will become even more concentrated as service fees escalate in a duopolistic market, while device and hardware costs fall.

1. The Commission Need Not Determine How to Implement Interoperability, But Rather Should Establish a Framework to Facilitate an Industry Solution for Implementation.

As reflected in the initial round of comments and further demonstrated below, the Commission can easily reconsolidate the Lower A, B, and C Blocks by substituting Band Class 12 for Band Class 17. Vulcan continues to believe that Band Class 12 provides the most technically viable and practical solution for achieving interoperability across the Lower 700 MHz band, with minimal transition costs. However, the Commission not need decide in this proceeding the *means* by which interoperability in the Lower 700 band should be achieved, as a practical matter. Rather, the Commission need only establish that Lower 700 MHz interoperability must be achieved, consistent with all other wireless bands, as a regulatory matter, and provide a framework and timeline within which 3GPP and the market participants can work together to effect Lower 700 MHz interoperability, subject to a Commission-imposed deadline. By doing so, the Commission would make clear that this proceeding is not about technical mandates or implementing specific technical standards, but about restoring competition, enhancing consumer welfare, ensuring the efficient use of spectrum, and furthering the public interest. Moreover, such an approach would

¹²³ See *supra* Section III.A.2.

help facilitate the development of an efficient and effective means for restoring Lower 700 MHz interoperability through industry collaboration.

Under this approach, the Commission should adopt an order that requires a return to interoperability in the Lower 700 MHz band and designates a specific time period, no longer than 6 months after adopting such order, during which 3GPP, licensees, and equipment vendors can collaborate in the industry 3GPP process to determine the most appropriate and efficient means of reconsolidating the Lower A, B and C Blocks. Such collaboration would occur with the mutual understanding that interoperability must be accomplished in accordance with the Commission's order. This 6-month timeframe provides for even more time than was necessary for 3GPP to ratify Band Class 17 (in August 2008) after it was first suggested (in May 2008).¹²⁴ The Commission should continue to monitor the 3GPP process during this time period and ensure that industry participants cooperate fairly and in accordance with the Commission's requirement that interoperability occur in the Lower 700 MHz band.

If an industry-wide consensus for effecting interoperability is not resolved and presented to the Commission within this 6-month timeframe, either through the adoption of Band Class 12 or some other means, the Commission can further exercise its authority and discretion to adopt Band Class 12 as the *de facto* fallback standard to be used for the Lower 700 MHz band, as recommended by the majority of parties in this proceeding and as further described below. Such an approach would provide industry participants with an adequate opportunity to decide upon an appropriate, cost-effective, and technically sound means of restoring interoperability, while containing the necessary safeguards to ensure that the public interest benefits from Lower 700 MHz interoperability are realized.

¹²⁴ See Vulcan Comments at 4-5 (describing how Band Class 17 was first proposed in May 2008 and approved approximately three months later in August 2008).

2. Band Class 12 Continues to Offer the Most Viable Means of Implementing Lower 700 MHz Interoperability With Minimal Cost to Licensees, Vendors, and Consumers.

Although the Commission need not decide how to achieve interoperability in the Lower 700 MHz band, it should consider substituting Band Class 12 for Band Class 17 if it prefers to take more immediate and deliberate action in this proceeding. As reflected in the initial round of comments, although such an approach is not the only available and cost-effective manner of implementing interoperability, it offers the most viable, streamlined, and easiest means of transitioning to a reconsolidated Lower 700 MHz band.

a. *Restoring Interoperability for Base Stations Can Be Accomplished Easily With Minimal Cost.*

The Commission's proposed approach of restoring interoperability by substituting Band Class 12 for Band Class 17 would have no impact on existing base station filtering.¹²⁵ As the Commission recognized in the NPRM, "a transition from Band Class 17 to Band Class 12 does not necessitate a change to base station filtering," and "[o]perators deploying networks in the Lower 700 MHz B and C Blocks can continue to filter base station receivers as they would for Band Class 17."¹²⁶ The record confirms the Commission's technical findings in this regard. T-Mobile, the nation's fourth largest nationwide wireless carrier, agreed that "there would be no need to require [B and C Block] licensees to modify their base stations to accommodate interoperability," and as such, "AT&T's existing base stations will be able to support its new customers using Band Class 12 handsets, as well as customers of other carriers . . . that incorporate Band Class 12."¹²⁷ Likewise, Vulcan reiterated that carriers using B and C Block spectrum would have no reason to change their operating frequencies to accommodate an interoperable environment, and restoring

¹²⁵ NPRM ¶ 50.

¹²⁶ *Id.* ¶ 32.

¹²⁷ T-Mobile Comments at 19.

Band Class 12 would therefore result in no replacements or modifications to their base station hardware.¹²⁸

b. *Restoring Interoperability for Future Mobile Devices Can Be Accomplished Easily With Minimal Cost.*

Reconsolidating the Lower A, B, and C Blocks would also have a minimal impact on the costs and availability of future interoperable consumer devices and handsets. Because Band Class 12 is an existing standard with approved technical specifications, restoring interoperability would not necessitate the development of new device chipsets or standards. Rather, device components are readily available to effect a restoration of Band Class 12, and devices employing the necessary interoperable components could be manufactured in the ordinary course of business,¹²⁹ and introduced to the marketplace without disrupting the normal product cycle typical in the wireless industry.¹³⁰

Likewise, Band Class 17 devices that have been developed, but which have not yet been disseminated to consumers, can achieve interoperability in two steps: (i) a remote software upgrade designed to enable the device to recognize and use the Lower A Block, and (ii) a small widening in the duplexer that can support the Lower A, B, and C Blocks.¹³¹ Restoring Band Class 12 would not require any new device power amplifiers, switches, or filters, and would not impact the size of Lower 700 MHz devices.¹³² The simple hardware modification to the duplexer could

¹²⁸ Vulcan Comments at 37.

¹²⁹ Cellular South Comments at 10.

¹³⁰ For example, Apple has released a new iPhone each year, on average. See Josh Smith, *iOS and iPhone Timeline: From iPhone to iOS 5 in 5 Years*, GottaBe Mobile News & Reviews, at <http://www.gottabemobile.com/2011/06/03/ios-and-iphone-timeline-from-iphone-to-ios-5-in-5-years/>.

¹³¹ Ex Parte Letter from Michele Farquhar, Hogan Lovells, Counsel to Vulcan Wireless, to Marlene Dortch, Secretary, Federal Communications Commission, WT Docket No. 11-18, RM-11592, Attachment at 2 (Dec. 5, 2011) (“*Vulcan Dec. 5 Ex Parte*”).

¹³² *Id.*

be implemented within a few months,¹³³ at minimal cost. These modifications would result in no marginal production costs. As noted by Cellular South, such component costs are so small, they would have “no impact on the wholesale cost of devices.”¹³⁴ In fact, as noted above, the increased competition and economies of scale that will result from a reunified Band Class 12 would actually reduce the cost of handsets and mobile broadband service alike, thereby decreasing the total cost to consumers.¹³⁵

c. *Restoring Interoperability Would Have No Impact on Existing Band Class 17 Devices or Consumers That Use Them.*

Restoring interoperability would also impose no burdens on consumers currently using Band Class 17 devices. As the Commission recognized in the NPRM, Band Class 17 devices already in use by consumers as of the interoperability transition deadline can continue to operate without any adverse impact.¹³⁶ T-Mobile’s comments confirm that grandfathering the existing use of Band Class 17 devices indefinitely, and allowing some Band Class 17 handsets to be manufactured for a reasonable time period, will ease the transition to a reconstituted Lower 700 MHz band.¹³⁷ While Vulcan agrees that adopting a rule to grandfather Band Class 17 operation in an interoperable environment would facilitate the reconsolidation of the Lower A, B, and C Blocks, it continues to urge the Commission to resolve this proceeding as soon as possible to

¹³³ *Id.*

¹³⁴ Cellular South Comments at 10. As reflected in Vulcan’s hands-on technical analysis, the associated component costs would, at most, result in a marginal cost of approximately 0.125% of the total handset cost, which would have no net effect on the wholesale market. *See Vulcan Dec. 5 Ex Parte*, Attachment at 20-21.

¹³⁵ *See supra* Section III.A.2.

¹³⁶ NPRM ¶ 50; Vulcan Comments at 40.

¹³⁷ T-Mobile Comments at 18-19; *see also* King Street Comments at 18; Cavalier & Continuum Comments at 16. Likewise, enabling legacy Band Class 17 devices to recognize Band Class 12 base stations (*i.e.*, to operate on the B and C Block capabilities of such base stations) can be accomplished through a remote, routine software update. *See* Vulcan Comments at 38.

prevent the incumbent B and C Block operators from inflating the number of Band Class 17 devices, which will never be able to operate on Lower A Block spectrum. As described further below, taking such prompt action will help minimize the costs of restoring interoperability and preserve the Commission's options in devising an implementation plan to restore Lower 700 MHz interoperability.¹³⁸

In assessing how restoring Lower 700 MHz interoperability may impact Band Class 17 consumers, the Commission should also take into account the consumer benefits that would result from a reunified Band Class 12. Like all consumers, any subscriber that now owns and uses a Band Class 17 device would benefit from enhanced choice, greater competition, and reduced mobile broadband service prices.¹³⁹

d. *The Original Expectation of Band Class 12 Demonstrates Its Practical Feasibility.*

As noted by the various public interest groups that support Lower 700 MHz interoperability, the widely held expectation that Band Class 12 would be the applicable technical standard following the completion of Auction 73 provides a further basis to conclude that a return to Band Class 12 “will not adversely affect the design and performance of mobile devices.”¹⁴⁰ This view, which was shared among all participants in Auction 73, should bear considerable weight in this proceeding. As the Commission knows, 3GPP established Band Class 12 for the Lower A, B, and C Blocks well before the completion of Auction 73. Consequently, parties—including AT&T and its device makers—knew that Band Class 12 would be the operative technical standard for each of those Lower 700 MHz spectrum blocks and, with that knowledge, bid for such spectrum accordingly. Only after AT&T successfully acquired the majority of the B

¹³⁸ See *supra* Section IV.B.3.

¹³⁹ See *supra* Section III.A.

¹⁴⁰ Public Interest Group Comments at 15.

and C Block spectrum in Auction 73 did it influence 3GPP to create Band Class 17. Yet the failure of AT&T and its device makers to raise any concerns about the adequacy of Band Class 12 prior to, or during, Auction 73 demonstrates their expectation that interoperability across the Lower 700 MHz band (*i.e.*, use of Band Class 12) would not impair the design, performance, or availability of mobile devices operating on the B and C Blocks. In fact, AT&T has already conceded that migrating to Band Class 12 is technically feasible¹⁴¹ and that “interference concerns should not affect the ability to deliver attractive interoperable devices.”¹⁴²

B. The Commission Should Restore Lower 700 MHz Interoperability As Soon As Possible.

The record also reflects widespread agreement that the Commission should restore Lower 700 MHz interoperability as soon as possible. As noted by U.S. Cellular, “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.”¹⁴³ Likewise, Cellular South and RCA agree that the Commission should act quickly to halt the ongoing harm and competitive imbalance caused by the unique fragmentation of standards in the Lower 700 MHz band.¹⁴⁴ By acting promptly, the Commission can harness the public interest benefits described above, restore much needed certainty to the U.S. wireless marketplace, prevent opponents of interoperability from inflating the cost of restoring interoperability in the Lower 700 MHz band, and abate the compounding economic harm caused by non-interoperability.

¹⁴¹ See Vulcan Comments at 37 & n.131 (*citing* Ex Parte Letter from Joan Marsh, Vice President – Federal Regulatory, AT&T Services, Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 07-293, IB Docket No. 11-149, RM-11592 (Feb. 21, 2012)).

¹⁴² Public Interest Group Comments at 16.

¹⁴³ U.S. Cellular Comments at 2.

¹⁴⁴ Cellular South Comments at 18; RCA Comments at 19.

1. Prompt Resolution Will Enable the Commission to Harness the Public Interest Benefits of a Reconsolidated Lower 700 MHz Band.

First and foremost, prompt action is necessary to harness the considerable public interest benefits described in Section III—empowering consumers, promoting competition, stimulating device innovation, facilitating nationwide roaming, and improving the efficient use of spectrum. Given the dire economic, competitive, and spectrum-related circumstances facing the U.S. wireless industry, the Commission cannot afford to delay actions to capture the transformative effects of such benefits. Restoring interoperability will especially help alleviate the well-known spectrum shortage that is afflicting the U.S. wireless industry. By resolving this proceeding as soon as possible, the Commission can help unleash 12 MHz of nationwide spectrum in the Lower A Block ideally suited for mobile broadband service. By liberating this swath of spectrum—25% of the entire Lower 700 MHz band—the Commission can help satisfy burgeoning market demand for mobile broadband service, and accelerate the widespread adoption of next-generation devices throughout the country, including in rural and unserved markets where many Lower A Block networks will be deployed. As reflected in the Commission’s rules and prior orders, facilitating the actual deployment of service on wireless spectrum is among the most important priorities for the Commission.¹⁴⁵

Likewise, consumers can no longer afford to be held captive by incumbent operators that invent artificial barriers to limit the functionality and network capabilities of next-generation mobile devices. Mobile broadband devices are no longer just “phones.” They are mobile computers that are increasingly essential to perform everyday tasks, and quickly becoming part of the nation’s fabric. Consumers rely on these devices for a variety of functions, and reasonably

¹⁴⁵ See, e.g., 47 C.F.R. § 27.14(g); Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands, *Notice of Proposed Rulemaking and Notice of Inquiry*, WT Docket No. 12-70, FCC 12-32 ¶¶ 10-12 (rel. Mar. 21, 2012).

expect the devices to work across multiple networks.¹⁴⁶ Yet the creation of Band Class 17 has frustrated that expectation, and eviscerates the ability of Band Class 17 devices to operate on Lower A Block spectrum. Swift reconsolidation of the Lower A, B, and C Blocks is therefore vital to protect consumer interests.

2. Prompt Resolution Will Restore Certainty for Lower A Block Licensees and the Mobile Broadband Marketplace.

Effecting a return to interoperable standards in the Lower 700 MHz band as soon as possible will also provide the certainty that Lower A Block licensees have so desperately needed to plan and construct their service. Such certainty is especially critical as the interim coverage and service obligations applicable to the Lower A Block spectrum approaches.¹⁴⁷ Other commenters agree. For example, NTCH notes that “the disadvantage that 700 MHz competitors face in the handset market becomes more immediate and more pressing” “[a]s the deadline for 700 MHz build-outs looms closer and closer.”¹⁴⁸ Similarly, Cricket stressed that speedy resolution to this proceeding “is critical to providing certainty to A Block licensees, who are facing a buildout deadline just over one year from now (if it is not extended), but are still tackling significant interference and operational challenges.”¹⁴⁹ As long as the Lower 700 MHz band remains fragmented, however, Lower A Block licensees will face crippling uncertainty regarding their ability to plan, deploy, and offer viable commercial mobile broadband service.¹⁵⁰ Moreover, without a reunified Lower 700 MHz band, A Block licensees cannot assess whether they will have reasonable access to affordable mobile devices and equipment that meet actual consumer

¹⁴⁶ See Public Interest Group Comments, Appendix at 3, 9-11.

¹⁴⁷ See 47 C.F.R. § 27.14(g) (requiring Lower A Block licensees to provide signal coverage and offer service over at least 35 percent of their licensed geographic service area by June 13, 2013, and over at least 70 percent by the end of the license term).

¹⁴⁸ Comments of NTCH, WT Docket No. 12-69, at 2 (June 1, 2012).

¹⁴⁹ Cricket Comments at 9.

¹⁵⁰ Vulcan Comments at 43.

demand.¹⁵¹ Such uncertainty will continue to thwart the ability of A Block licensees to plan, deploy, and provide mobile broadband service.

3. Prompt Resolution Will Prevent Opponents of Interoperability From Artificially Inflating the Costs of Restoring Interoperability.

Restoring interoperability as soon as possible will also allow the Commission to thwart any attempt by opponents of interoperability to inflate the cost of restoring interoperability by flooding the market with non-interoperable Band Class 17 devices. Although the Commission can easily restore interoperability, as described above,¹⁵² the implementation costs may increase as additional generations of non-interoperable devices are introduced to the marketplace. As noted by RCA, “the longer the Commission waits to resolve interoperability in the Lower 700 MHz, the longer it will take to transition from Band Class 17 to Band Class 12.”¹⁵³

The likelihood of further Band Class 17 entrenchment is high. As Cellular South noted, “[s]o long as Band 17 exists separately from Band 12, device manufacturers will focus their Lower 700 MHz efforts primarily if not exclusively on developing Band 17 devices for use by AT&T.”¹⁵⁴ Moreover, AT&T continues to be aggressive in offering its subscribers Band Class 17 throughout the country, going so far as to assert before the Commission that it is “well within [its] rights” to offer products using Band Class 17.¹⁵⁵ The pace of AT&T’s introduction of smartphones, including Band Class 17 devices, is growing at an exceptional rate.¹⁵⁶ Accordingly, the

¹⁵¹ *Id.*

¹⁵² *See supra* Section IV.A.

¹⁵³ RCA Comments at 19.

¹⁵⁴ Cellular South Comments at 20.

¹⁵⁵ Ex Parte Letter from Joseph P. Marx, Assistance Vice President, AT&T Services Inc., to Marlene H. Dortch, Secretary, FCC, RM-11626, RM-11592 (Feb. 28, 2012).

¹⁵⁶ *See* Press Release, AT&T, *Best-Ever Mobile Broadband Sales and Strong Cash Flows Highlight AT&T’s Fourth-Quarter Results*, Jan. 26, 2012, available at <http://www.att.com/gen/press-room?pid=22304&cdvn=news&newsarticleid=33762&mapcode=corporate|financial> (noting that in the (continued on next page)

Commission should act quickly to prevent AT&T from further escalating the costs that stem from an entrenched consumer supply of non-interoperable Band Class 17 mobile devices.

4. Prompt Resolution Will Abate the Economic Harms Caused by Non-Interoperability.

Finally, the Commission should restore interoperability quickly to mitigate the compounding economic harms caused by non-interoperability, which includes the stranded investment of Lower A Block licensees who have been unable to deploy viable service.¹⁵⁷ As Vulcan explained in its prior comments, the Lower A Block licenses sold in Auction 73 yielded nearly \$4 billion in proceeds, over a third of which was paid by small, regional, or greenfield operators.¹⁵⁸ Vulcan acquired its A Block licenses for approximately \$113 million (the sixth highest amount spent on A Block licenses and the tenth highest amount spent among all Auction 73 bidders), paying \$1.36 per MHz POP, one of the highest costs per MHz POP for comparable markets in the auction.¹⁵⁹ Yet Vulcan, like other similarly situated A Block licensees, has not been able to capitalize on its investment.¹⁶⁰ Rather, deployment obstacles caused in large part by non-interoperability in the Lower 700 MHz band have thwarted Vulcan's ability to benefit from or

fourth quarter of 2011, AT&T sold 9.4 million smartphones, 50% more than the previous quarterly record and nearly double the smartphone sales in the third quarter of 2011).

¹⁵⁷ Vulcan Comments at 45.

¹⁵⁸ *Id.* at 45-46.

¹⁵⁹ Most Lower A Block licenses for comparable Economic Areas (*i.e.*, within 10% of POPs) were sold in Auction 73 at considerably lower prices, including:

- St. Louis, MO-IL (EA 096) : \$1.07 per MHz POP (21% lower);
- Minneapolis-St. Paul, MN-WI-IA (EA 107): \$0.95 per MHz POP (30% lower);
- Sacramento-Yolo, CA (EA 164): \$0.91 per MHz POP (33% lower);
- Indianapolis, IN-IL (EA 067): \$0.87 per MHz POP (36% lower);
- Columbus, OH (EA 051): \$0.83 per MHz POP (39% lower);
- Denver-Boulder-Greeley, CO-KS-NE (EA 141): \$.80 per MHz POP (41% lower); and
- Kansas City, MO-KS (EA 099): \$0.72 per MHz POP (47% lower)

See Auction of 700 MHz Band Licenses Closes, *Public Notice*, DA 08-595, Attachment A (Mar. 20, 2008); 2000 U.S. census data, available at http://wireless.fcc.gov/auctions/data/maps/entysv2000_census.xls.

¹⁶⁰ See RCA Comments at 9 (noting that lack of interoperability has sidelined nearly \$2 billion in spectrum investment by RCA members).

cultivate its investment. Verizon Wireless's recent efforts to dispose of its Lower A Block holdings, including a recent transfer of its A Block license in Chicago to Leap Wireless and its publicly announced intent to sell the balance of its remaining Lower A Block spectrum, evidences the diminished economic value of Lower A Block licenses since the end of Auction 73.¹⁶¹

The economic harm is not limited to Lower A Block investments, however. As Chairman Genachowski has explained, "the economic value created by FCC auctions" is approximately "10 times" the value obtained at auction.¹⁶² Thus, by fostering the development of Band Class 17, opponents of interoperability have destroyed billions of dollars in economic value, expressed through fewer jobs, lost innovation, and diminished marketplace competition. The Commission can decelerate this vast economic cost by restoring interoperability as soon as possible.

5. The Commission Should Restore Interoperability Before the End of 2012.

Proponents of interoperability generally agreed that the Commission should take action to reunify the Lower 700 MHz band by the end of 2012, and to ensure full implementation of such restoration by the end of 2013. For example, U.S. Cellular urged the Commission adopt a rule requiring all mobile devices to support Band Class 12 "no later than 12 months from the effective date of an order or the end of 2013, whichever is earlier."¹⁶³ Similarly, King Street, Cavalier, and

¹⁶¹ See Letter from Rick Kaplan, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, to John T. Scott, III, Vice President & Deputy General Counsel, Verizon Wireless, WT Docket No. 12-4 (May 15, 2015); Letter from Kathleen Grillo, Senior Vice President – Federal Regulatory Affairs, Verizon Wireless, to Rick Kaplan, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, WT Docket No. 12-4 (May 22, 2012); Vulcan Comments at 46. Furthermore, Verizon's disposition of Lower A Block spectrum means that it will no longer be a potential driver of Band Class 12 device development. U.S. Cellular Comments at 9.

¹⁶² *Genachowski 2012 House Statement*.

¹⁶³ U.S. Cellular Comments at 1.

Continuum all urged the Commission “not to delay beyond the end of this year” in adopting an interoperability solution, and to mandate full implementation in 2013.¹⁶⁴

Vulcan therefore continues to urge the Commission to issue an order in this proceeding by the end of 2012, and to adopt the timeline below that would facilitate the development of an industry solution for how to best implement interoperability, while ensuring that full restoration of Lower 700 MHz interoperability would occur in the marketplace no later than 18 months after the date of such order.

Timeframe for Implementing Interoperability	Milestone
By month 6	<i>Industry Collaboration to Determine Means of Implementation and Standards Ratification for Interoperability</i> – Six-month period during which 3GPP and industry participants may collaborate to determine the most appropriate and efficient means of achieving interoperability across the Lower 700 MHz band. The Commission can monitor the 3GPP process to ensure that interested parties cooperate fairly and in accordance with the Commission’s order that interoperability must occur in the Lower 700 MHz band.
By month 12	<i>Base Station Transition</i> – All carriers must upgrade their base stations to support interoperability across the entire Lower 700 MHz band.
By month 15	<i>Interim Device Transition</i> – Any carrier that offers at least one mobile device that is capable of operating on any paired spectrum block within the Lower 700 MHz band must commercially offer and support, in each market in which the carrier offers service to any person or entity, at least one mobile device that is capable of operating across all paired spectrum blocks in the Lower 700 MHz band.
By month 18	<i>Full Transition</i> – All carriers must ensure that each device that is capable of operating in any paired spectrum block within the Lower 700 MHz band, which the carrier offers to any person or entity in any market, is capable of operating

¹⁶⁴ King Street Comments at 17-18; Cavalier & Continuum Comments at 15-16. See also Blooston Rural Carriers Comments at 11 (urging the Commission to “impose an interoperability requirement for all Lower 700 MHz equipment and devices that are manufactured after June 2013”).

	across all paired spectrum blocks in the Lower 700 MHz band.
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As set forth in Section IV.A, such an implementation timeline is imminently feasible, establishes a clear plan and framework for restoring interoperability in an incremental and practical manner, and provides adequate deference to the industry in deciding how to achieve Lower 700 MHz interoperability. This proposed 18-month implementation schedule would also allow Band Class 12 devices to be introduced to the marketplace in the normal product cycle typical of the wireless industry,¹⁶⁵ while giving due consideration to the costs, however small, that incumbent operators using Band Class 17 may incur to return their infrastructure to an interoperable environment.

V. THE COMMISSION HAS THE NECESSARY LEGAL AUTHORITY TO RESTORE INTEROPERABILITY IN THE LOWER 700 MHZ BAND AND SHOULD EXERCISE THAT AUTHORITY UNDER THE CIRCUMSTANCES.

Commenters agree that the Commission’s legal authority to restore interoperability in the Lower 700 MHz band is “beyond question.”¹⁶⁶ The Commission’s authority derives from Title III, Section 201(b), and its own precedent.

As noted in the NPRM, the Commission has “broad and extensive authority [under Title III] to manage the use of spectrum.”¹⁶⁷ The vast majority of commenters supported this conclusion, agreeing that numerous provisions of Title III give the Commission the power to condition its licensing actions on compliance with rules it deems are consistent with the public interest, convenience, and necessity, and take actions that generally promote the wider and more effective use of radio in the public interest, including the regulation of licensees and the equipment

¹⁶⁵ See *supra* n.130.

¹⁶⁶ King Street Comments at 18.

¹⁶⁷ NPRM ¶ 58 (citing 47 U.S.C. §§ 301, 302, 303, 307, 309, 316).

and apparatus they use.¹⁶⁸ As T-Mobile concluded, “any of these provisions, standing alone or in combination, amply justify the Commission’s adoption of an interoperability requirement.”¹⁶⁹

Distilled to their essence, the objections of the lone dissenter, RIM, do not demonstrate that the Commission lacks authority under Title III to reconsolidate the Lower 700 MHz band, but instead merely question the wisdom of doing so.¹⁷⁰ However, RIM offers no tangible evidence that restoring interoperability will undermine the public interest, and therefore does not offer any valid basis to delay Commission action in this proceeding.

Section 210(b) of the Communications Act offers additional support for the Commission’s power to restore interoperability in the Lower 700 MHz band. As the various public interest groups explained, Section 201(b) permits the Commission to prohibit unreasonable constraints by wireless carriers, such as the implementation of a propriety band class that creates “an artificial restriction on the ability of both A block competitors and their customers to roam and acquire comparable devices and applications.”¹⁷¹ That is precisely what AT&T has accomplished here, warranting Commission action to reconstitute the Lower 700 MHz band and eliminate the unreasonable constraint on competition created by Band Class 17.

Not only does the Commission have statutory authority to adopt such a solution, it has exercised similar authority in the past.¹⁷² As NTCA noted, the Commission “has consistently encouraged interoperability standards to achieve objectives of universality, competitive delivery of service, the ability of consumers to switch between systems at low cost, and competitive markets

¹⁶⁸ See, e.g., T-Mobile Comments at 22-23; RCA Comments at 6; Horry Comments at 6; Cricket Comments at 3-6; Cellular South Comments at 7-8; Public Interest Group Comments at 20-21.

¹⁶⁹ T-Mobile Comments at 23.

¹⁷⁰ See RIM Comments at 15-20.

¹⁷¹ Public Interest Group Comments at 21.

¹⁷² See RTG Comments at 4-6 (discussing the Commission’s history of promoting interoperability).

for CMRS equipment.”¹⁷³ Several commenters made apt comparisons between restoring interoperability in the Lower 700 MHz band and other interoperability solutions adopted by the Commission. NTCA, Cellular South, T-Mobile, and U.S. Cellular each pointed out that restoring interoperability at 700 MHz is no different than the interoperability solution adopted by the Commission when it first licensed cellular spectrum in 1981, noting that the Commission found at that time that “consumer equipment should be capable of operating over the entire range of cellular spectrum to ‘insure full coverage in all markets and compatibility on a nationwide basis.’”¹⁷⁴ T-Mobile likewise pointed to the interoperability solution the Commission adopted for the public safety broadband network, providing further evidence of the Commission’s authority in this area.¹⁷⁵ Cellular South further noted that “[t]he Commission . . . has a track record of prohibiting other restrictive arrangements that become obstacles to competitive access in the telecommunications market,” citing the Commission’s 2000 and 2007 orders imposing nationwide roaming obligations, among others.¹⁷⁶ These examples demonstrate that restoring interoperability would be consistent with the Commission’s “longstanding interest in promoting the

¹⁷³ NTCA Comments at 12.

¹⁷⁴ NTCA Comments at 12 (quoting Inquiry into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems; Amendment of Parts 2 and 22 of the Commission’s Rules to Cellular Communications Systems, *Report and Order*, 86 FCC 2d 469 (1981) (“Cellular Report & Order”). See also T-Mobile Comments at 22; Cellular South Comments at 2-4; US Cellular Comments at 11-12.

¹⁷⁵ T-Mobile Comments at 22 (citing Implementing a Nationwide, Interoperable Public Safety Network in the 700 MHz Band, *Second Report and Order*, 22 FCC Rcd 15289 (2007)).

¹⁷⁶ Cellular South Comments at 3-4 (citing Automatic and Manual Roaming Obligations Pertaining to Commercial Mobile Radio Services, *Notice of Proposed Rulemaking*, 15 FCC Rcd 21628, 21630 ¶ 5, 21634 ¶ 15 (2000); Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers, *Report and Order and Further Notice of Proposed Rulemaking*, 22 FCC Rcd 15817, 15828, ¶ 28 (2007); Promotion of Competitive Networks in Local Telecommunications Markets, *First Report and Order and Further Notice of Proposed Rulemaking* in WT Docket No. 99.217, *Fifth Report and Order and Memorandum Opinion and Order* in CC Docket No. 96-98, *Fourth Report and Order and Memorandum Opinion and Order* in CC Docket No. 88-57, 15 FCC Rcd 22983 ¶¶ 160-164 (2000); Exclusive Service Contracts for Provision of Video Services in Multiple Dwelling Units and Other Real Estate Developments, *Report and Order and Further Notice of Proposed Rulemaking*, MB Docket No. 07-51, 22 FCC Rcd 20235 (2007); Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order*, FCC 07-132 ¶ 202 (Aug. 10, 2007)).

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.”¹⁷⁷

Finally, the Commission should put no stock in AT&T’s assertion that requiring B and C Block licensees to use Band Class 12 would be contrary to the terms under which the Commission auctioned the 700 MHz spectrum.¹⁷⁸ As evident in the record, AT&T’s own post-auction influence over the 3GPP process resulted in the current anti-competitive configuration of the Lower 700 MHz band.¹⁷⁹

The unusual circumstances that led to the lack of interoperability in the Lower 700 MHz band, which have created an excess of severe marketplace harms that will not be resolved through an industry solution (a point on which multiple commenters agreed¹⁸⁰) without Commission action, have yielded a “worst case scenario” that justifies the Commission’s exercise of its legal authority in this limited instance to restore interoperability and facilitate its implementation through industry collaboration. An order to restore interoperability in this proceeding need not constitute any controlling precedent or “technical mandate” for Commission involvement in future band plans. Additionally, this proceeding is not about prescribing technical specifications or standards for mobile platforms. Nothing in this proceeding would require the FCC to impose its discretion on or assume the duties of 3GPP, which would continue in its role of establishing technical standards for the wireless industry. Rather, this proceeding is about restoring competition, enhancing consumer welfare, and ensuring the proper and efficient use of spectrum

¹⁷⁷ US Cellular Comments at 11-12.

¹⁷⁸ AT&T Comments at 37.

¹⁷⁹ Vulcan Comments at 2-11.

¹⁸⁰ See U.S. Cellular Comments at 10; RCA Comments at 15; MetroPCS Comments at 13; King Street Comments at 14; Cavalier & Continuum Comments at 12; Cellular South Comments at 6; Public Interest Comments at 17.

for mobile broadband use. Accordingly, in this limited instance, the Commission should exercise its authority under the Communications Act, and directives from Congress, to restore interoperability in the Lower 700 MHz band. Not only is such a course of action legally permissible, but is necessary to achieve the numerous benefits of interoperability that have been uniquely denied the public for this band.

VI. CONCLUSION

For the reasons stated herein, the Commission should take prompt action to restore interoperability in the Lower 700 MHz band. As reflected in the initial round of comments, doing so would benefit and empower consumers throughout the country in direct and meaningful ways, by (i) removing artificial limitations that permanently preclude consumers from using their mobile devices on Lower A Block networks and which serve only inhibit consumer choice, (ii) spurring competition among mobile broadband service providers, (iii) facilitating innovation in the mobile device market, and (iv) promoting nationwide roaming arrangements. Restoring interoperability would also yield more efficient spectrum use, which is of paramount importance in light of the spectrum-related constraints faced by the Commission and the mobile wireless industry. Additionally, the repeated technical studies presented to the Commission, based on valid engineering analyses and reasonable assumptions, conclusively demonstrate that restoring Lower 700 MHz interoperability is feasible and can be accomplished without delay at minimal cost. Meanwhile, opponents of interoperability have offered no evidence to support their baseless claims that Channel 51 and high-powered E Block transmissions will adversely impact Band Class 12 devices operating in the B and C Blocks. They have also shown no desire to cooperatively work to achieve an industry solution. The Commission can incentivize and facilitate the necessary cooperation. Accordingly, Vulcan urges the Commission to adopt an order to require

interoperability by the end of 2012, establish a framework for to facilitate an industry solution to implement interoperability, and to ensure full implementation within 18 months thereafter.

Respectfully submitted,

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EXHIBIT 1

A. AT&T’S White Paper: Errors, Flawed Assumptions, and Other Deficiencies¹

Claim	Reality
A device using a Band Class 17 filter will have less interference than a device with a Band Class 12 filter. ²	<ul style="list-style-type: none"> The Lower A Block Study revealed that Band Class 12 devices are adequately protected.
The scientific method is not applicable to evaluating the Lower 700 MHz band because (i) high-powered E Block transmissions have not yet commenced and (ii) commercial Band 12 LTE network have only begun to be deployed. ³	<ul style="list-style-type: none"> Lower E block transmissions have commenced. DISH operated a Lower E Block mobile video broadcast system in Atlanta, Georgia, for several years, as reflected in Lower A Block Study. The potential architecture for E Block networks is known and a matter of public record.
The Lower A Block Study failed to examine Band Class 12 devices. ⁴	<ul style="list-style-type: none"> Band Class 12 devices were not commercially available at the time of the Lower A Block Study. The Lower A Block Study was conducted in a manner that characterized the receiver performance inside of the RF filter, and therefore reflected the performance of a Band Class 12 device.
Based on the 3GPP specifications, the desired signal must be 33 dB stronger than the adjacent signal to avoid adjacent channel interference. ⁵	<ul style="list-style-type: none"> The 3GPP specifications permit the adjacent signal to be 31.5 dB stronger than the desired signal. The white paper authors misapply the 3GPP specifications for device receiver performance.

¹ AT&T Comments, Exh. A.

² *Id.* at 1.

³ *Id.* at 3.

⁴ *Id.* at 4.

⁵ *Id.* at 6.

Claim	Reality
The FCC conducted Auction 73 in 2009. ⁶	<ul style="list-style-type: none"> The FCC actually conducted Auction 73 in 2008.
The potential risk of interference to Lower 700 MHz devices was well-known. ⁷	<ul style="list-style-type: none"> Although the geographic exclusion zones to which incumbent Channel 51 licensees would be entitled was known at the time of Auction 73, there was no expectation that harmful interference would result to Lower 700 MHz devices. The 2002 Report and Order indicated that adjacent channel harmful interference would not occur from 50 kW transmissions.
Transmissions from mobile devices can interfere with set top boxes used to receive Channel 51 broadcast signals. ⁸	<ul style="list-style-type: none"> This claim lacks any supporting measurements or data. This claim is extraneous and has no bearing on whether Band Class 12 devices would perform normally on the Lower B and C Blocks.
Channel 51 and E Block broadcasts will cause interference within the frequency ranges used by base stations to receive transmissions from mobile devices. ⁹	<ul style="list-style-type: none"> Base station interference is irrelevant to device interoperability because the 3GPP specifications permit base station filtering to be specific to the spectrum blocks on which a carrier operates.
High-powered Channel 51 and E Block transmissions will cause interference in the frequency ranges used by mobile devices to receive transmissions from the base station. ¹⁰	<ul style="list-style-type: none"> This claim lacks any supporting measurements or data.

⁶ *Id.* at 8.

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

Claim	Reality
Band Class 17 was adopted in the 3GPP process in recognition of significant interference concerns. ¹¹	<ul style="list-style-type: none"> Only AT&T, Motorola, and Qualcomm advocated for Band Class 17, while Ericsson questioned the propriety of fragmenting the Lower 700 MHz standards.¹²
Band Class 12 devices, which do not filter the A Block, are subject to greater intermodulation interference from Channel 51 than Band Class 17 devices. ¹³	<ul style="list-style-type: none"> The function of a receiver filter is irrelevant in defining device performance within the Lower B and C Blocks. This rests on the incorrect understanding of the 3GPP device specifications, which allow devices to handle a stronger signal in the adjacent channel with no impact.
High-powered E Block transmissions will cause interference to Band Class 12 devices, and less so for Band Class 17 devices. ¹⁴	<ul style="list-style-type: none"> The OOB interference would be identical for both Band Class 12 and Band Class 17 devices.
The adjacent channel interference to Band Class 12 may be so high that it results in receiver “overloading.” ¹⁵	<ul style="list-style-type: none"> As a practical matter, an over-the-air signal from the E Block would not be at a level which overloads the receiver. Therefore, it would be incapable of increasing the temperature of a device to such an extent that it damages the device’s electronics.
Mitigation techniques are inadequate to adequately reduce the potential interference from Channel 51 and E Block transmissions. ¹⁶	<ul style="list-style-type: none"> Mitigation techniques are irrelevant because the Lower A Block Study and V-COMM Studies demonstrated that Band Class 12 devices will not suffer harmful interference near Channel 51 and Lower E Block transmission facilities.

¹¹ *Id.*

¹² *See* Vulcan Comments at 4 & n.13.

¹³ AT&T Comments, Exh. A at 9-10.

¹⁴ *Id.* at 14.

¹⁵ *Id.* at 15.

¹⁶ *Id.* at 16.

Claim	Reality
<p>Appropriately measuring the difference in Band Class 12 and Band Class 17 mobile devices would require a network that supports both band classes.¹⁷</p>	<ul style="list-style-type: none"> • This claim contradicts years of industry practice, in which lab testing is routinely performed across devices using a controlled environment.
<p>Measuring the impact of E Block transmissions on Band 12 and 17 networks would be especially difficult because operators of those networks would likely be adding transmitters, optimizing antenna tilts and power, and effecting other daily changes to maximize the network performance.¹⁸</p>	<ul style="list-style-type: none"> • This claim represents a misunderstanding of the broadcast mobile video business and interference mechanisms. E Block network operators optimize to cover as broad a geographic area as possible, with the smallest number of sites. The data stream of these networks remains constant. The networks are not limited in capacity like cellular systems.

¹⁷ *Id.* at 19.

¹⁸ *Id.* at 19.

B. The Qualcomm Analysis: Errors, Flawed Assumptions, and Other Deficiencies

Claim	Reality
<p>High-powered E Block signals would cause blocking interference to Band Class 12 devices seeking to receive a 5 MHz signal on the B Block or a 10 MHz signal on the B and C Blocks.¹⁹</p>	<ul style="list-style-type: none"> • Qualcomm did not test actual 700 MHz components or devices. • Qualcomm assumed Band Class 12 devices would use the minimum 3GPP receiver selectivity, even though (i) that is rarely the case in real world applications, and (ii) the Lower A Block Study already demonstrated that commercially available 700 MHz devices exceed the minimum 3GPP specifications by at least 28 dB. • Using the empirical findings of the Lower A Block Study and V-COMM Study, Qualcomm’s analysis would show that Lower E Block signals pose no risk of blocking interference to Band Class 12 devices operating on the B or C Block.
<p>High-powered E Block signals would cause intermodulation interference to Band Class 12 devices seeking to receive a 5 MHz signal on the B or C Block or a 10 MHz signal on the B and C Blocks.²⁰</p>	<ul style="list-style-type: none"> • Qualcomm did not test actual 700 MHz components or devices. • To predict intermodulation power levels, Qualcomm used an internally developed simulation tool, but did not disclose any inputs or methodologies relating to this simulation tool to enable a third party to independently verify the results. • Qualcomm failed to identify the linearity assumed for the low-noise amplifier. A properly designed 700 MHz device would sufficiently avoid any such intermodulation interference.

¹⁹ Qualcomm Comments at 4.

²⁰ *Id.*

Claim	Reality
<p>Channel 51 DTV signals would cause reverse intermodulation interference to Band Class 12 devices seeking to receive a 5 MHz signal on the C Block or a 10 MHz signal on the B and C Blocks.²¹</p>	<ul style="list-style-type: none"> • Qualcomm did not test actual 700 MHz components or devices. • Qualcomm tested a 1900 MHz amplifier, even though 700 MHz power amplifiers are commercially available, with unspecified third-order intermodulation response characteristics that are not representative and could be materially worse than commercial 700 MHz components. • Qualcomm failed to document the test procedures or configuration that it used to measure the 1900 MHz intermodulation interference to enable third party validation. • It appears that Qualcomm tested the 1900 MHz power amplifier in isolation, rather than as part of an integrated device, which will understate the receiver protection. • Qualcomm failed to consider the 700 MHz antenna coupling losses that would further reduce Channel 51 signal strength at the power amplifier. • Qualcomm failed to perform field measurements of commercial Channel 51 broadcast transmissions to support their claims that intermodulation interference could even occur with broadcast signals encountered in the real world. • Qualcomm employed theoretical propagation models to predict Channel 51 signal strength using a mobile antenna height of 10 meters, much higher than the average device at street

²¹ *Id.*

Claim	Reality
	level, and which would substantially overstate the Channel 51 coverage area.
Base station collocation is not an effective mitigation strategy to reduce interference caused by high-powered E Block signals. ²²	<ul style="list-style-type: none"> Qualcomm’s explanation for this claim assumed unrealistic and incorrect device blocking levels and do not reflect actual device performance. The Lower A Block Study confirmed that commercially available devices can handle the 50 kW ERP without requiring collocation.
The DISH Network mobile video trial system did not enable the Lower A Block Study to be conducted in an appropriate scenario. ²³	<ul style="list-style-type: none"> This claim ignores the Lower A Block Study findings that conclusively demonstrated that the E Block signal level near a tower is dependent upon the RF characteristics of that tower alone, and not on the number of towers in a city. Thus, even if additional E Block towers were installed in Atlanta, the Lower A Block Study would have yielded the same results.

²² *Id.* at 29.

²³ *Id.* at 32.

Claim	Reality
<p>The relationship between the B Block deployment in Atlanta and the E Block system operating in Atlanta is unlikely to be representative of what consumers in other parts of the country will face and the MediaFLO network should be used as the benchmark for assessing E Block interference.²⁴</p>	<ul style="list-style-type: none"> • Qualcomm offered no facts or analysis to justify this claim. • The strongest signal level identified by Qualcomm was -29 dBm, which is far below the blocking threshold of commercial 700 MHz devices measured in the Lower A Block Study. • Because Qualcomm was operating the MediaFLO service in 2008, at the time Band Class 17 was developed, if it was concerned about the potential for interference to Band Class 12 devices, Qualcomm could have provided test data from the site tests that Qualcomm performed to optimize the MediaFLO service launch. Yet it did not do so.
<p>The Lower A Block Study may have tested devices equipped with a Band Class 17 filter, which would confirm the superior ability of Band Class 17 devices to reject E Block signals.²⁵</p>	<ul style="list-style-type: none"> • The Lower A Block Study was conducted by accounting for the RF filter, and the results are therefore valid for Band Class 12 devices.
<p>Because B and C Block LTE base stations are generally colocated, disparities in signal levels between them would not exist.²⁶</p>	<ul style="list-style-type: none"> • Qualcomm used flawed logic is making this claim. Two operators could just as easily deploy base stations without collocation, which could result in widespread near-far interference issues among LTE base stations. The Lower A Block Study demonstrated this case in Atlanta (with respect to AT&T and Verizon base stations). If 700 MHz devices performed at the minimum 3GPP specifications (assumed by Qualcomm), widespread interference would occur between adjacent LTE systems. This does not occur, however, because devices offer substantially

²⁴ *Id.*

²⁵ *Id.* at 33 n.33.

²⁶ *Id.* at 33.

Claim	Reality
	better blocking performance, as confirmed by the Lower A Block Study.

C. Responses to the Technical Objections to the Lower A Block Study

1. Alleged Technical Flaw #1: To analyze Channel 51 interference, the Lower A Block Study purports to test whether a Band 17 device would work if it were subject to interference within its filter's passband ranges, and if it does, assumes that a Band 12 device would also work when faced with Channel 51 operations that create interference within the Band 12 device's passband frequencies.

Response: This claim demonstrates a fundamental misunderstanding of the tests performed in the Lower A Block Study to assess Channel 51 interference concerns. The Lower A Block focused on whether the components in a commercial LTE device would generate intermodulation interference with amplitude above the noise floor for the worst case Channel 51 and device transmit power levels in a given market. By quantifying how Band Class 17 filters impact the device, the Lower A Block Study conclusively showed that a device using a Band Class 12 filter would also not experience harmful interference from Channel 51 operations.

2. Alleged Technical Flaw #2: The Lower A Block Study assumes that Channel 51 intermodulation would be a problem only where AT&T is operating in both the B and C Blocks, and focuses on off-center transmissions that understate the actual impact of Channel 51 interference.²⁷

Response: The Lower A Block Study lab tests placed the LTE channel in the middle of the frequency blocks to represent the worst case scenario frequency overlap, and tested multiple LTE device transmit frequencies to produce a measurable level of intermodulation interference. The only device transmission that produced any measurable intermodulation was the Lower C Block transmission, and the intermodulation product overlapped with the lowest edge of the Lower B Block. Thus, the Lower A Block Study revealed that a 10 MHz LTE channel was necessary for the device to experience any overlap with the receive frequencies.

²⁷ AT&T Comments at 36 & Exh. A at 21.

3. Alleged Technical Flaw #3: The Lower A Block Study is based on an insufficient sample of field measurements.²⁸

Response: This claim reflects a misunderstanding of the methodology employed in the Lower A Block Study. By using a scanning receiver to continuously measure the Channel 51 signal throughout Atlanta, the Lower A Block Study measured thousands of locations to quantify the Channel 51 signal level throughout the area.

4. Alleged Technical Flaw #4: The Lower A Block Study is based on measurements that were too far away from transmitters to provide relevant information.²⁹

Response: This objection is meaningless as a practical matter. The strongest degree of potential interference would not be directly underneath the Channel 51 transmitter. Rather, to cover the largest possible area, a DTV system would use antennas with high elevation pointed towards the horizon. Thus, the strongest Channel 51 signal is rarely within 12 square kilometers of the transmitting tower. The V-COMM Study confirmed the Lower A Block Study findings by using actual DTV antenna patterns, which do not direct energy to the ground (but rather to the horizon).³⁰ This objection also disregards the fact that some measurements in the Lower A Block Study were conducted within 50 feet of the base transmitter at an LPTV site.

5. Alleged Technical Flaw #5: The Lower A Block Study's use of a vertical whip antenna to measure the signal from a DTV station using a horizontal polarized antenna understated the signal strength of the DTV station.³¹

Response: The Lower A Block Study used a Super-M Ultra Mobile antenna (mobile 08-ANT-0860), which is appropriate for covering frequencies between 25 MHz and 6 GHz.³² Additionally, using a vertically polarized antenna is appropriate because LTE devices use vertically polarized antennas. Consequently, the Lower A Block

²⁸ AT&T Comments at 36 & Exh. A at 22; Qualcomm Comments at 55-56.

²⁹ *Id.*

³⁰ *V-COMM Study Report* at 11.

³¹ Qualcomm Comments at 56.

³² See MP Antenna, Super-M Ultra Mobile Multi-Polarized HAM, Scanner, and Two-Way Radio Antenna, Data Sheet (Model No. 08-ANT-0860), available at http://www.mpantenna.com/products/wp-content/uploads/downloads/PDF/08-ANT-0860_DATA.pdf.

Study methodology is technically sound.

6. Alleged Technical Flaw #6: The Lower A Block Study used an unrecognized formula to predict reverse intermodulation interference, and there is no recognized formula for measuring this type of interference.³³

Response: This claim lacks merit because it does not even attempt to determine whether the formula used in the Lower A Block Study is correct. Either Qualcomm felt no need to determine whether the formula is correct, or has tacitly acknowledged that the formula is correct.

7. Alleged Technical Flaw #7: In measuring potential interference from Channel 51 transmissions, the Lower A Block Study did not include a margin of 4 to 8 dB that is applied to measure signal levels to anticipate potentially interfering signals from adjacent power transmitters.³⁴

Response: The Lower A Block Study used 3GPP standard testing processes to determine the appropriate values to measure signal levels. Qualcomm, as a member of 3GPP, has no basis to challenge these standard testing techniques. Even if an 8 dB margin was employed, it would make the strongest Channel 51 signal -28 dBm, still well below the level necessary to produce intermodulation at the noise floor for either the Lower A Block Study or Qualcomm's own analysis.

³³ *Id.* 56.

³⁴ *Id.* at 57.