Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Policies Regarding Mobile Spectrum Holdings	)	WT Docket No. 12-269

COMMENTS OF THE COMPUTER & COMMUNICATION INDUSTRY ASSOCIATION (CCIA)

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I. INTRODUCTION AND SUMMARY

The Computer & Communications Industry Association ("CCIA") is an international nonprofit membership organization representing companies in the computer, Internet, information technology, and telecommunications industries. Together, CCIA's members employ nearly half a million workers and generate approximately a quarter of a trillion dollars in annual revenue. CCIA promotes open markets, open systems, open networks and full, fair and open competition in the computer, telecommunications and Internet industries. Before the Commission, CCIA has continually expressed its support for pro-competitive telecom policies that recognize the reality of an asymmetrical market structure.

Pursuant to the Federal Communication Commission's ("Commission") September 28, 2012 Notice of Proposed Rulemaking ("NPRM"),[1] CCIA files these Comments regarding the Commission's proposed rules "on retaining or modifying the current case-by-case analysis used to evaluate mobile spectrum holdings in the context of transactions and auctions."[2] CCIA supports the Commission's objective "to ensure that [its] policies and rules afford all interested parties greater certainty, transparency and predictability to make investment and transactional decisions, while also promoting the competition needed to ensure a vibrant, increasingly mobile economy driven by innovation."[3]

The Commission's mobile spectrum holding rules are more important now than ever. In the face of accelerating consumer demand for wireless data and limited additional broadband spectrum, the Commission must ensure that non-dominant competitors have access to critical spectrum resources. Ending the excessive concentration of spectrum resources in the hands of

[1] Policies Regarding Mobile Spectrum Holdings, *Notice of Proposed Rulemaking*, WT Docket No. 12-269, FCC 12-119 (rel. Sept. 28, 2012) ("*NPRM*").
[2] *Id.* ¶ 2.
[3] *Id.* ¶ 15.

the Twin Bells promises to reinvigorate wireless broadband competition and prevent higher prices, reduced innovation, and slower deployment, all of which harm consumers. At the same time, the Commission must exercise care to avoid across-the-board spectrum-holding rules that do not consider the many different ways incumbents and competitors hold and deploy spectrum to provide innovative new broadband services to the public.

The Commission's rules must, in short, reflect a balance between two extremes of overly permissive and overly rigid spectrum-holdings rules. Different carriers have different blends of spectrum bands available to serve their customers, and different spectrum bands have substantially different propagation characteristics that affect their utility and value for providing competitive wireless broadband services. The Commission's rules must recognize these differences, but should stop short of requiring an analysis so granular and band-specific as to offer no predictive value.

To provide clarity for investors and guidance to the industry, the Commission should categorize spectrum bands and then employ two separate spectrum screens – one for commercial mobile spectrum holdings below 1 GHz and another for all commercial mobile capable spectrum holdings. The Commission needs to update its current all-inclusive spectrum screen to reflect changes in spectrum allocations and, in the future, will need to periodically update both spectrum screens to reflect changing allocations, technical rules, and market dynamics that make different spectrum useful for broadband services. To reflect actual market competition, the Commission should continue to administer the screen on a case-by-case basis at both the local and national level. And while the Commission should remain flexible in applying pro-competitive conditions and divestiture requirements, it should take steps to ensure that divestitures actually promote competition rather than simply reinforcing the dominance of the top two wireless providers.

Finally, in deciding what spectrum is attributed to carriers, the Commission must keep pace with the evolving marketplace, including new leasing and spectrum sharing arrangements. These adjustments to the mobile spectrum holdings rules promise to help ensure a vibrant and competitive market for years to come.

II. AS THE COMMISSION HAS REPEATEDLY RECOGNIZED, THE TWIN BELLS DOMINATE THE WIRELESS VOICE AND DATA MARKET

AT&T and Verizon Wireless dominate the mobile wireless market. Both AT&T and Verizon received cellular spectrum free of charge when mobile wireless services were first introduced in the mid-1980s. Moreover, as incumbent local exchange carriers, the two companies continue to exploit their respective advantages stemming from control of the critical wholesale wireline infrastructure, upon which wireless competitors depend for backhaul capacity. Taking advantage of these benefits, AT&T and Verizon continue to drive the wireless marketplace toward a duopoly.

When the Commission began licensing Cellular Spectrum in 1982, it introduced 50 MHz of spectrum, which it divided into two blocks.[4] The Commission awarded one of the blocks in each cellular market area to a local incumbent wireline carrier, such as one of the Regional Bell Operating Companies ("RBOCs") that subsequently, through numerous mergers, developed into the Twin Bells.[5] As the Commission has recognized, the incumbents received important first-mover advantages as a result of this policy.[6] "Historically," the Commission has noted, the

[4] Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, including Commercial Mobile Services, WT Docket No. 10-133, *Fifteenth Report*, 26 FCC Rcd 9664 ¶ 270 (2011) ("*Fifteenth Mobile Wireless Competition Report*").

[5] *Id.*

[6] To acknowledge the difference the additional opportunity Verizon, AT&T and other ILECs received from a discriminatory spectrum-distribution mechanism is *not* to say that the consumer price of wireless communication services is somehow raised if licensees pay for their spectrum instead of getting it for free. *See* Evan Kwerel, *Spectrum Auctions Do Not Raise the Price of Wireless Services: Theory and Evidence*, FCC Office of Plans and Policy (Oct. 2000) available at http://xrl.us/bn3ori. Because sunk costs are unrecoverable, they generally should not

ILECs such as Verizon and AT&T, "have held much of the share of mobile services provided in most markets across the country."[7]

AT&T's and Verizon Wireless's legacy wireline networks also helped fuel their current market shares and spectrum dominance. The Commission has explained that "[b]ackhaul connections are an integral component of a wireless service provider's network" because they "link mobile providers' cell sites to wireline networks, carrying wireless voice and data traffic for routing and onward transmission."[8] As such, the Commission has found that "[b]ackhaul costs currently constitute a significant portion of a mobile wireless operator's network operating expense, and the demand for backhaul capacity is increasing."[9] The Twin Bells are the only vertically integrated wireless providers with control over large segments of the backhaul market. Other wireless providers must purchase backhaul services, often from "the incumbent local exchange carriers against whose wireless affiliates they compete."[10] It is, therefore, no coincidence that these legacy wireline providers, relying upon free spectrum received from the days prior to the Commission's receipt of auction authority and their control over critical wired infrastructure, are the two largest wireless providers today.

By all relevant measures, AT&T and Verizon Wireless dominate the wireless market. For instance, as the Commission Staff explained in the *AT&T/T-Mobile Staff Report*, "[a]s of year-end 2010, AT&T and Verizon Wireless each accounted for over 30 percent of subscribers,

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influence current or future pricing behavior of rational economic firms; however, companies still benefit from having had their competitors expend resources for spectrum acquisitions that they did not have to. In this case, the benefit Verizon, AT&T and a few other incumbent local exchange carriers enjoyed from receiving the initial low-frequency spectrum allocations for free allowed the Twin Bells to use capital that they would have spent on spectrum resources on other activities, such as network build out, instead. This benefit has had lasting effects on the market.

[7] *Id.*

[8] *Fifteenth Mobile Wireless Competition Report* ¶ 319.

[9] *Id.* ¶ 322.

[10] *Id.* ¶ *321*.

and earn[ed] over 30 percent of the industry's total service revenues." Indeed, examining a widely used indicator of profitability, earnings before interest, taxes, depreciation and amortization ("EBITDA"), the Twin Bells' market share is even greater.[11] In its staff report, the Commission stated that "AT&T accounted for 35 percent and Verizon Wireless for 45 percent of total industry EBITDA."[12] By comparison, Sprint and T-Mobile accounted for a combined 27 percent of subscribers and earnings, and only 16 percent of total industry EBITDA.[13]

AT&T's and Verizon's market-dominating positions are both reflected in and reflective of their sizeable spectrum holdings below 1 GHz—the most valuable spectrum for mobile deployment. Combined, the Twin Bells hold "approximately 73 percent of below 1 GHz spectrum [nationwide], measured on a MHz-POPs basis."[14] That percentage is even greater when one examines "the spectrum below 1 GHz suitable for the provision of mobile broadband . . . . Verizon Wireless and AT&T together hold approximately 90 percent of Cellular spectrum based on [MHz-POPs]."[15] The Twin Bells have an even greater concentration of below 1 GHz spectrum in major markets. In the top 54 most populous U.S. markets, AT&T and Verizon together control 92 percent of the paired 700 MHz spectrum suitable for commercial mobile broadband use; in the top 10 markets, they hold 100 percent.[16] As former Commissioner Copps observed, "[b]y any reasonable spectrum screen or other spectrum holdings analysis, this level of concentration should give us pause."[17]

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[11] Applications of AT&T, Inc. And Deutsche Telekom AG, *Staff Analysis & Findings*, WT Docket No. 11-65, DA-11-1955A2 ¶ 37 & n.112 (rel. Nov. 29, 2011) ("*AT&T/T-Mobile Staff Report*").
[12] *Id.* ¶ 37 (citing *Fifteenth Mobile Wireless Competition Report* at ¶ 214).
[13] *Id.*
[14] *Id.* ¶ 48.
[15] *Fifteenth Mobile Wireless Competition Report* ¶ 2.
[16] *See* Statement, attached to Letter from Charles W. Logan, Counsel to Access Spectrum, LLC, to Marlene H. Dortch, FCC Secretary, WT Docket No. 06-150, at 1 (June 17, 2010).
[17] *AT&T-Qualcomm Order* (dissent of Comm'r Copps).

Absent Commission intervention, all signs point to continued concentration of spectrum. In the past 6 months alone, AT&T has purchased WCS licenses from Comcast and Horizon Wi-Com, LLC. It has bought 700 MHz licenses from Ronan Telephone Company, Hot Springs Telephone Company, McBride Spectrum Partners, LLC, Triad 700, LLC, Farmers Telephone Company, Inc., Twin Valley Management, Inc. and the Ponderosa Telephone Company, among many others. AT&T has also acquired AWS licenses from Cavalier Wireless, LLC and David Miller. Through these purchases, AT&T's population-weighted spectrum holdings increased 1 MHz in the 700 MHz band (25 to 26 MHz), 1 MHz in the 1.9 GHz band (34 to 35 MHz), 1 MHz in the AWS band (6 to 7 MHz), and 15 MHz in the WCS band (13 to 28 MHz).

The Commission has recognized that "if permitted to aggregate large amounts of spectrum," a mobile provider may "exert undue market power or inhibit market entry by other service providers."[18] AT&T and Verizon have already aggregated these "large amounts of spectrum" and are already exerting "undue market power." Indeed, analysts have recognized that market concentration is currently hurting the wireless market.[19] The Commission should reinvigorate wireless market competition by updating its spectrum screen and applying it to holdings below 1 GHz in addition to overall spectrum holdings.

[18] *NPRM* ¶ 7 (citing Implementation of Sections 3(n) and 332 of the Communications Act – Regulatory Treatment of Mobile Services, GN Docket No. 93-252, *Third Report and Order*, 9 FCC Rcd 7988, 8100 ¶ 238 (1994)).
[19] *See* FitchRatings, *Spectrum Inspection: The Auction Roadmap* at 13 (Apr. 16, 2012) ("[W]ireless operations have experienced a general decline in subscribers, profitability, and EBITDA generation. Fitch expects headwinds on the wireless business to continue and include the competitive landscape, the disadvantages of a regional operator in an increasingly duopolistic market, high unemployment, slow economic recovery, and the lack of an iPhone service offering.").

III. THE SPECTRUM SCREEN USED TO REVIEW THE MOST RECENT TRANSACTIONS IS DYSFUNCTIONAL AND DOES NOT PROMOTE COMPETITION

First adopted in 2004, the Commission's spectrum screen is an important tool to monitor and promote wireless competition.[20] The Commission uses the spectrum screen to identify "local markets where an entity would acquire more than approximately one-third of the total spectrum suitable and available for the provision of mobile telephony/broadband services."[21] Under this analysis, suitable spectrum is spectrum that can support mobile service based on the physical properties of the spectrum, associated equipment technology, potentially conflicting rules, and incompatible existing uses. Available spectrum is spectrum that will be suitable for mobile use in the near term.[22] If a carrier holds more than one-third of the total spectrum suitable and available for mobile service in any given market, the Commission will examine that market more in-depth and determine whether there is "an increased likelihood or ability in those markets for the combined entity to behave in an anticompetitive manner."[23] This one-third threshold ensures that "at least three competitors hav[e] access to approximately the same amount of suitable spectrum for providing mobile wireless broadband service."[24] For markets that present anticompetitive risks, the Commission has a host of remedies at its disposal, including requiring a provider to divest spectrum holdings and imposing competitive conditions.

[20] Applications of AT&T Wireless Services, Inc. and Cingular Wireless Corporation For Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 04-70, *Memorandum Opinion and Order*, 19 FCC Rcd 21522 (2004).
[21] *NPRM* ¶ 17 (citing Applications of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC and Cox TMI, LLC for Consent to Assign AWS-1 Licenses, *et al*., *Memorandum Opinion and Order and Declaratory* Ruling, WT Docket No. 12-4, 27 FCC Rcd 10698 ¶ 59 (2012) ("*Verizon Wireless-SpectrumCo Order*")).
[22] *Id.* ¶ 26 (citing *AT&T-Qualcomm Order*, 26 FCC Rcd at 17606 ¶ 38).
[23] *Id.* ¶ 8.
[24] *Id.* ¶ 34.

Under the screen that the Commission has used in evaluating spectrum acquisitions since the 2008 *Verizon Wireless-ALLTEL Order*,[25] the Commission has determined that spectrum suitable and available for mobile telephony and mobile broadband services includes cellular (50 MHz), PCS (120 MHz), SMR (26.5 MHz),[26] and 700 MHz (80 MHz) spectrum, as well as AWS-1 (90 MHz) and BRS (55.5 MHz) spectrum where available.[27] Thus, for markets where both the AWS-1 and BRS bands are available, there is 422 MHz of suitable and available spectrum. A carrier triggers the screen if it holds greater than 145 MHz,[28] which is approximately one-third of this total (rounded up). For markets where AWS-1 or BRS spectrum are not available, the threshold is adjusted downward to account for the reduced availability.[29] The Commission has previously considered several other bands to include in the spectrum screen, including EBS, MSS/ATC, AWS-2/3, WCS, 3650-3700 MHz, and 2155-2175 MHz [30] But so far, the Commission has declined to add these bands to the screen.[31] Despite changes in the wireless market since the Commission first employed this screen in 2008, the Commission has used this same screen in the 2009 *AT&T-Centennial Order*,[32] the 2011 *AT&T-Qualcomm Order*,[33] the

[25] Applications of Cellco Partnership d/b/a Verizon Wireless and Atlantis Holdings LLC For Consent to Transfer Control of Licenses, Authorizations, and Spectrum Manager and *De Facto* Transfer Leasing Arrangements and Petition for Declaratory Ruling that the Transaction is Consistent with Section 310(b)(4) of the Communications Act, WT Docket No. 08-95, *Memorandum Opinion and Order and Declaratory Ruling*, 23 FCC Rcd 17444 (2008) ("*Verizon Wireless-ALLTEL Order*").
[26] The Commission rounds this 26.5 MHz of SMR spectrum up to 30 MHz.
[27] *AT&T-Qualcomm Order* ¶ 39.
[28] The 145 MHz threshold is calculated as follows: 50 MHz (cellular) + 120 MHz (PCS) + 26.5 MHz (SMR) + 80 MHz (700 MHz) + 90 MHz (AWS-1) + 55.5 MHz (BRS) = 422 MHz (or 425.5 MHz if SMR is rounded up to 30 MHz). One-third of 422 MHz is only 140.7 MHz (one-third of the rounded-up SMR total of 425.5 MHz is only 141.8 MHz), but the Commission rounds this up to 145 MHz. Rounding up this number inflates the amount of spectrum holdings required to trigger the screen.
[29] The screen is 95 MHz where neither BRS nor AWS-1 spectrum is available; 115 MHz where BRS spectrum is available but AWS-1 spectrum is not available; and 125 MHz where AWS-1 spectrum is available but BRS spectrum is not available. Applications of AT&T Inc. and Centennial Communications Corp. for Consent to Transfer Control of Licenses, Authorizations, and Spectrum Leasing Arrangements, *Memorandum Opinion and Order*, WT Docket No. 08-246, 24 FCC Rcd 13915 ¶ 46 (2009) ("*AT&T-Centennial Order*").
[30] *AT&T-Qualcomm Order* ¶ 39.
[31] *Id.*
[32] *Id.* ¶ 43.

2011 *AT&T/T-Mobile Staff Report*,[34] and most recently, the August 2012 *Verizon Wireless-SpectrumCo Order*.[35]

Although the Commission has been slow to update its screen, its approach to reviewing spectrum concentration is not inherently flawed. As the Commission has recently recognized, revisions to the spectrum included in the current screen are necessary to reflect the rapidly changing and consolidating marketplace for mobile voice and data services.[36] Indeed, the Commission explained in the *AT&T-Qualcomm Order*, "revisions to the screen may be necessary" for future transactions.[37] The Commission also assured that it planned to "continue to monitor any technological or market-driven developments."[38] In fact, in its *Verizon Wireless-SpectrumCo Order*, the Commission acknowledged that it "intend[e]d to initiate a proceeding soon to review our policies governing mobile wireless spectrum holdings."[39]

A couple of examples readily illustrate the need for the Commission to update bands considered available for use under the spectrum screen. For instance, the Commission currently includes the ten-megahertz Upper 700 MHz D Block in the list of spectrum that is suitable and available for broadband, even though the Commission has since reallocated this spectrum exclusively to public safety use for broadband interoperability among first responders. In addition, the Commission has continued to identify Specialized Mobile Radio ("SMR") spectrum as having 26.5 MHz of spectrum available even though the band continues to undergo a years-long transition and, upon completion of the transition, will yield only 14 MHz capable of

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[33] *Id.* ¶ 42.
[34] *AT&T/T-Mobile Staff Report* ¶ 37 & n.112.
[35] *Verizon Wireless-SpectrumCo Order* ¶ 59.
[36] *AT&T-Qualcomm Order* ¶ 42.
[37] *Id.*
[38] *Id.*
[39] *Verizon Wireless-SpectrumCo Order* ¶ 63.

carrying mobile broadband service.[40] Including such large segments of spectrum in the spectrum denominator adds considerable headroom for anti-competitive spectrum acquisitions to occur without actually triggering the screen.

These examples only touch upon the revisions necessary to make the spectrum screen reflective of spectrum that is actually suitable and available for mobile use. The Commission should "continue to consider spectrum based on its suitability and availability for a given product market."[41] But unless the screen is updated, the screen will fail to perform its function of promoting wireless competition.

IV. THE FCC SHOULD ADD A SPECTRUM SCREEN FOR SPECTRUM HOLDINGS BELOW 1 GHZ TO ITS SPECTRUM-HOLDINGS ANALYSIS

Different bands of spectrum offer different degrees of utility to provide wireless voice and data services. Although a single spectrum screen for all spectrum bands can offer some measure of guidance to the industry, an all-inclusive spectrum screen remains susceptible to producing both false positives and false negatives. That is, a spectrum-concentration screen that sweeps in too many low-value, high-frequency bands will tend not only to identify potential competitive harm in the aggregation of high-frequency bands where the competitive risk is minimal and the barriers to entry low, but also to overlook potential competitive harm in the aggregation of low-frequency resources where the competitive risk is grave and the barriers to entry are high. The Commission can remedy the failures of the current screen and limit the opportunities for gamesmanship and unintended consequences a single screen creates by adopting a second spectrum-screen for the high-value spectrum below 1 GHz. The Commission must act quickly, however. One of the last pools of readily available low-frequency spectrum –

[40] *AT&T-Qualcomm Order* ¶ *42; AT&T/T-Mobile Staff Report* ¶ 45 n.137.
[41] *NPRM* ¶ 27.

the broadcast incentive spectrum – is slated for auction in 2014. If a below 1 GHz screen is to have any near term utility in promoting wireless competition, the Commission should adopt such a screen (or a band-specific limitation) prior to finalizing service rules for the broadcast incentive auction.[42]

The Commission's current all-inclusive spectrum screen treats every megahertz as equally valuable and useful no matter its frequency, technical restrictions, or operational limits. But, as the Commission and its staff have repeatedly noted, "all spectrum is not created equal.[43] Every band has different technical, regulatory, economic, and operational constraints that affect the band's ability to deliver broadband services to consumers. And while differences among spectrum allocations abound, the most pronounced differences – and the only ones that cannot be changed by rule, policy, technology or emergent economic scale – are the technical characteristics of the frequencies below 1 GHz compared to those above 1 GHz.

Systems operating in lower-band spectrum can deliver more signal power and superior performance to consumers than higher-band spectrum operating with the same-sized cell.[44] As the Commission has recognized, "the more favorable propagation characteristics of lower frequency spectrum, *i.e.*, spectrum below 1 GHz, allow for better coverage across larger geographic areas and inside buildings."[45] These characteristics have a direct bearing on the cost

[42] *See* Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Notice of Proposed Rulemaking*, Docket No. 12-268, FCC 12-118 (rel. Oct. 2, 2012).
[43] "An Introduction to Spectrum Engineering," Julius Knapp, Chief, Office of Engineering and Technology, U.S. Federal Communications Commission, as part of the Department of Energy Seminar on Spectrum Policy for the Utility Sector, December 8, 2010; s*ee also Fifteenth Mobile Wireless Competition Report* ¶¶ 290, 292*; AT&T-Qualcomm Order* ¶¶ 31, 49; John Stone and Matthew Yukelson, *Wireless Spectrum: Invisible Real Estate*, Near Earth, LLC at 5 (February 2008).
[44] *See, e.g., AT&T-Qualcomm Order* ¶ 49.
[45] *NPRM* ¶ 35.

of deployment and have affected where and when carriers with only higher-frequency spectrum can economically deploy service.[46]

The two largest holders of this spectrum, AT&T and Verizon, readily acknowledge the advantages of spectrum below 1 GHz. Verizon, for instance, has bluntly stated that "[a]ll spectrum is not created equal for all carriers."[47] As Verizon's Chief Financial officer has said, "the propagation of [700 MHz] spectrum into buildings is very high, so you don't need as much cell splitting or build out that you would need from other types of spectrum."[48] Verizon Wireless's Senior Vice President and Chief Technology Officer has echoed these sentiments, explaining that Verizon Wireless has a "Spectrum Advantage" because lower frequencies have "better in-building penetration" and "increased coverage."[49] So too has AT&T recognized the importance of spectrum below 1 GHz. In its bid to acquire T-Mobile, AT&T contended "that a significant benefit to T-Mobile customers would be their newly acquired access to AT&T's spectrum below 1 GHz, enabling those customers to receive both extended rural coverage and 'superior in-building and in-home service.'"[50] Verizon's Chief Technology Officer Tony Melone provided a graphic synopsis of the advantages of below 1 GHz spectrum:[51]

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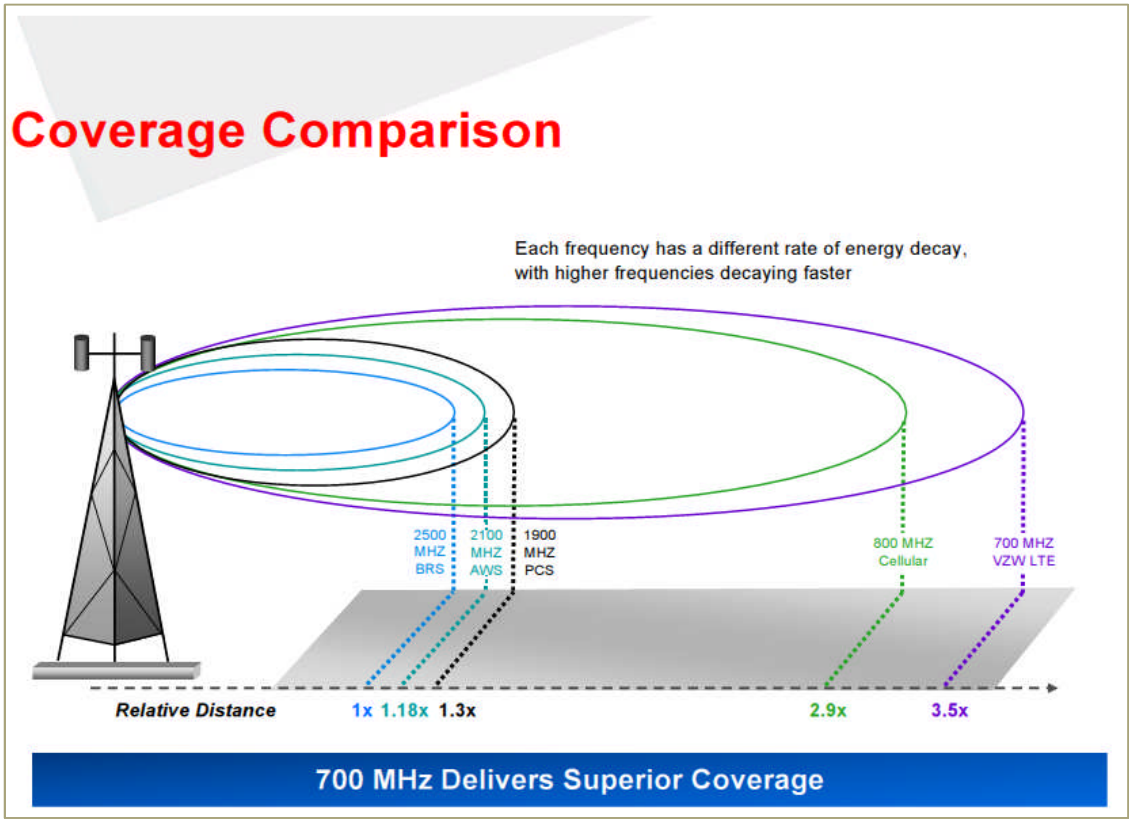
[46] *See United States v. Verizon Communications Inc. and ALLTEL Corp.*, Competitive Impact Statement, Case No. 08-cv-1878, at 5-6 (filed Oct. 30, 2008), available at http://www.justice.gov/atr/cases/f238900/238947.pdf ("because of the characteristics of PCS spectrum, providers holding this type of spectrum generally have found it less attractive to build out in rural areas")
[47] *Remarks of Fran Shammo, Chief Financial Officer, Verizon Communications*, May 23, 2012, available at http://barclays-r1.alldigital.net/viewer/webcast/GTMTC/249.
[48] *Id.*
[49] *Presentation of Tony Melone, Senior Vice President and Chief Technology Officer, Verizon Wireless*, Wells Fargo Securities Technology, Media & Telecom Conference at 12-13 (Nov. 10, 2010).
[50] *AT&T-Qualcomm Order* ¶ 49.
[51] *Presentation of Tony Melone, Senior Vice President and Chief Technology Officer, Verizon Wireless*, Wells Fargo Securities Technology, Media & Telecom Conference at 13 (Nov. 10, 2010).

Presentation of Tony Melone, Verizon Wireless Chief Technology Officer
November 2010



The diagram Verizon's CTO offered to investors in 2010 may in fact undersell the relative efficiency of lower frequency spectrum. A more representative picture would show how many more base stations are required at higher-frequency spectrum to cover the same distance in all directions as the 700 MHz spectrum: a ratio estimated at five to one or more, depending on the frequency and other factors.[52]

[52] *See, e.g., Comments of Intel Corporation*, MB Docket No. 04-210 at 3 (summarizing the Congressional testimony of Patrick Gelsinger, Intel's Chief Technology Officer, where he explained that using 2.5 GHz frequency "would require 4 to 5 times as many base stations to achieve equal geographic coverage" as 700 MHz frequency); Letter from the Brattle Group to the Honorable Joe Barton *et al*. at 8 n.11 (May 18, 2005) (Patrick P. Gelsinger, Chief Technology Officer, Intel Corporation, Testimony before the Senate Committee on Commerce, Science and Transportation (June 9, 2004)) available at http://xrl.us/bn3r6j; Mikael Ricknas, *Update: Verizon to Roll out LTE in Two US Cities This Year*, InfoWorld (Feb. 18, 2009) (citing Verizon Executive Vice President and Chief Technology officer as indicating that for every base station at 700 MHz, three or four are needed at 2.6 GHz)

Higher frequency spectrum has value too, of course. Because high-frequency signals travel shorter distances than low-frequency signals, carriers can use higher-frequency spectrum to enhance network capacity.[53] Increased capacity is partially a byproduct of its higher rate of decay: higher frequency spectrum requires many times more base stations necessary to achieve minimal coverage over a geographic area, and deploying more base stations produces greater frequency reuse, which, in turn, increases network capacity.

The merits of high-frequency spectrum only go so far, however. Operators with lower frequency spectrum can replicate most, if not all, of the capacity benefits of higher-frequency spectrum simply by using lower power, re-pointing antennas, and making other minor adjustments to standard operating procedures. The adjustments allow low-frequency spectrum to achieve much the same capacity benefits of the higher-frequency spectrum.[54] But while low-frequency spectrum can achieve many of the capacity benefits of high-frequency spectrum with technical adjustments to the system, no number of lawful technical adjustments can coax high-frequency spectrum to provide the wide-area, building-penetrating coverage of low-frequency spectrum.

Unlike licensees of high-frequency spectrum, moreover, holders of low-frequency spectrum have a resource better suited to how networks actually mature over time. When a carrier first deploys any new spectrum band, the network is empty. Maximizing profit generally means providing a coverage area to encourage customers to use the new network infrastructure for their voice and data traffic. As customers migrate to the new infrastructure, capacity

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available at http://xrl.us/bn3q54. The exact ratio of required towers at higher versus lower frequencies depends on "multiple factors such as path loss, the link budget, cell tower height, and the geometry of the area being covered." *See, e.g.*, Peter Rysavy, *Low Versus High Radio Spectrum*, HighTech Forum (Mar. 5, 2012) available at http://www.hightechforum.org/low-versus-high-radio-spectrum/.

[53] *See, e.g.*, *NPRM* at ¶ 35.

[54] *See, e.g.*, J.M. Vanderau, R.J. Matheson, and E.J. Haakinson, *A Technological Rationale to Use Higher Wireless Frequencies*, U.S. Dep't of Commerce (Feb. 1998) available at http://www.f8kgl.com/IMG/pdf/98-349.pdf.

demands increase and begin to approach the limits of the initial coverage build. Low-frequency spectrum allows carriers to capture the benefits of wide-area coverage with the least amount of network investment. Because carriers can make technical adjustments to low-frequency transmissions that limit the signal's reach, carriers with low-frequency spectrum have some measure of flexibility to add base stations to the coverage build, which increases frequency reuse and increases capacity for customers. Unlike carriers with high-frequency spectrum, carriers with low-frequency spectrum do not have to build a dense and costly coverage network from day one.[55] Instead, carriers with low-frequency spectrum can limit their economic overhead, deploy a thin coverage network when traffic is low, and then increase capacity on an incremental and planned basis as customer traffic approaches the limit of the initial coverage build. [56]

The intrinsic physical differences of spectrum above and below 1 GHz – and the concomitant economic benefits – are reflected in prices paid for spectrum in different bands. Many factors, from device ecosystem, to the potential for harmful interference, to interoperability, affect spectrum pricing. Nonetheless, few can dispute that, regardless of the particular characteristics of a given band, higher frequency spectrum routinely trades at a fraction of the price of lower frequency spectrum in auctions and private sector transactions. AT&T, for instance, paid eighteen times as much per unit (MHz-POP) for its low-frequency 700 MHz band spectrum in 2007 auction ($3.15 per MHz-POP) than it received for selling its high-frequency

[55] *Fifteenth Mobile Wireless Competition Report* ¶ 293 ("A licensee that exclusively or primarily holds spectrum in a higher frequency range generally must construct more cell sites (at additional cost) than a licensee with primary holdings at a lower frequency in order to provide equivalent service coverage, particularly in rural areas.").

[56] In a perfectly competitive market, differences in a company's demand for spectrum should depend on how the company combines spectrum with other inputs, such as base station infrastructure, to yield a given output of mobile voice and data services. In theory, a firm with substantial spectrum resources has simply opted to rely on spectrum in lieu of base station infrastructure to provide the level of voice and data services the market demands. In practice, however, the market for spectrum resources is not perfectly competitive and spectrum and base station infrastructure are especially imperfect substitutes for one another. Base station zoning and siting delays, equipment costs, backhaul expenses (where the incumbent LECs also dominate the market) and other real-world factors place a premium on low-frequency spectrum and impose a cost on high-frequency spectrum that, unless remedied, has and will continue to function as a strong impediment to robust competition in the wireless market.

2.5 GHz band spectrum that same year ($0.17 per MHz-POP).[57] Likewise, on the secondary market, AT&T paid more than six times as much ($1.06 per MHz Pop) for Aloha Partners' Lower 700 MHz spectrum in 2007,[58] and five times as much ($0.87 per MHz Pop) for Qualcomm's Lower 700 MHz spectrum in 2011.[59] Investment analyst J.P. Morgan's valuations reflect these disparities:[60]

Band	Relative Value (per MHz-POP)
Cellular	$1.70
700 MHz	$1.37
PCS	$0.76
AWS	$0.76
MMDS	$0.25
2.5 GHz	$0.19

The Commission's analysis of an input as critical to the wireless industry as spectrum should recognize the profound physical and economic differences between spectrum above and below 1 GHz. The Commission can do so by adopting a spectrum screen for holdings under 1 GHz in addition to an overall spectrum screen prior to any low-frequency spectrum auctions, such as the broadcast incentive auction scheduled for 2014.[61]

The incentive auction will significantly increase the amount of available under 1 GHz spectrum, perhaps as much as 120 MHz.[62] Because the Commission is only authorized to conduct the incentive auction of broadcast spectrum one time under § 6403(b) of the Spectrum

[57] *See* Opposition to Petitions to Deny and Reply to Comments of Intel Corp., WT Docket No. 08-94 at 4 (Aug. 4, 2008); *Verizon Nearly Lost Bid for National C-Block License*, Comm. Daily (Mar. 25, 2008).
[58] *See* Jamie Townsend, *Whether it Wins or Loses Block E, Qualcomm Suffers*, Seeking Alpha (Feb. 22, 2008) available at http://seekingalpha.com/article/65656-whether-it-wins-or-loses-block-e-qualcomm-suffers.
[59] *See* Today's News, *AT&T to Buy 700 MHz Spectrum from Qualcomm*, Comm. Daily (Dec. 21, 2010).
[60] J.P. Morgan, *Spectrum Valuation Overview – Carrier by Carrier Base-Case Spectrum Value Across Wireless Industry*, Telecom Services and Towers, North American Equity Research (Nov. 30, 2011).
[61] Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Notice of Proposed Rulemaking*, Docket No. 12-268, FCC 12-118 (rel. Oct. 2, 2012).
[62] Federal Communications Commission, Connecting America: The National Broadband Plan at 88-91 (2010).

Act,[63] the broadcast incentive auction may represent the last opportunity to pick up substantial under 1 GHz holdings for many years to come. If the Commission were ultimately to decide to adopt an under 1 GHz screen, but did so after conducting the incentive auction, the under 1 GHz screen would do little good to remedy the anticompetitive threat justifying its adoption. In the *Notice*, the Commission explained that it would continue to apply the current screen (*i.e.* only an overall screen),[64] and anticipated that it would grandfather in spectrum held before the screen was adopted.[65] Following this approach would prove particularly problematic because of the likelihood of further concentration of under 1 GHz holdings in the incentive auction. As already discussed, AT&T and Verizon hold 73% of the spectrum under 1 GHz and based on their market positions, can only be expected to seek even greater control of low-frequency spectrum resources that are critical elements for broadband competition and innovation.[66] The Commission should act now to adopt a below 1 GHz screen.

V. THE COMMISSION SHOULD CONTINUE TO ADMINISTER THE SPECTRUM SCREEN ON A CASE-BY-CASE BASIS

The Commission currently examines the competitive effect of spectrum acquisitions involving the transfer, assignment, or lease of Commission spectrum licenses. In its examination, the Commission employs a case-by-case review of the acquisition.[67] The Commission should continue this practice.

The Commission's examination of spectrum acquisitions applies a two-part screen to identify markets where an acquisition necessitates further competitive analysis. First, the

[63] Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. 112-96 § 6403(e) (Feb. 22, 2012).
[64] *NPRM* ¶ 16 n.59 (explaining that it would "continue to apply its current case-by-case approach to evaluate mobile spectrum holdings during its consideration of secondary market transactions and initial spectrum licensing after auctions" during the pendency of the rulemaking).
[65] *Id.* ¶ 49 (indicating that the Commission did not "anticipate revisiting licensees' current spectrum holdings under any revised policy" but instead "would anticipate grandfathering those holdings").
[66] *AT&T-Qualcomm Order* ¶ 48.
[67] *NPRM* ¶ 8.

Commission considers changes in market concentration that would occur as a result of the transaction. This change is measured by comparing the pre- and post-acquisition Herfindahl-Hirschman Index ("HHI"). Second, the Commission examines the amount of spectrum that is "suitable and available on a market-by-market basis for the provision of mobile telephony/broadband service."[68] In those markets highlighted by one or both of the two-part screen, the Commission conducts a market-by-market review to determine whether the spectrum acquisition would increase the likelihood or ability of the acquiring entity to behave in an anti-competitive manner in those markets. Finally, the Commission considers other variables that "are important in predicting the incentives and ability of service providers to successfully reduce competition . . . and transaction-specific public interest benefits that may mitigate or outweigh any harms arising from the transaction."[69]

The Commission should continue its current practice of examining the competitive effect of spectrum acquisitions on a case-by-case basis. A case-by-case analysis that examines spectrum holdings at both the local and national levels, identifies the relevant product market and employs an updated spectrum screen that takes into account both the quality and quantity of spectrum will allow the Commission to prevent anti-competitive behavior and best serve the public interest.

A. The Commission Should Implement the Spectrum Screen at Both the Local and National Levels

As the Commission correctly notes, "[d]efining the relevant geographic market is important in accurately assessing the competitive effects that may result from a potential

[68] *Id.*
[69] *Id*.

transaction."[70] Under its case-by-case analysis, the Commission has stated that it uses the local geographic market size to determine any potential competitive harms arising from spectrum concentration occurring as a result of an acquisition.[71] The Commission also considers whether a spectrum acquisition has potential nationwide competitive effects, particularly when the proposed acquisition would see a mobile carrier gain spectrum throughout the country.[72]

The Commission should continue assessing the potential competitive effects of spectrum acquisitions on both a local and national level. The Commission should employ this analysis regardless of the method of acquisition, whether occurring by transfer, assignment, or auction. As the Commission correctly explains in the *Verizon Wireless-SpectrumCo Order*, analyzing the effects on competition in local markets enhances the competitive evaluation because consumers live, work, and shop locally.[73] Consumers typically purchase goods and services, including mobile services, in a geographic area relatively close to home. Consumers often want to "touch and feel" phones and user equipment in the store, and the consumer demand for a hands-on buying experience has only increased with the proliferation of larger and more complex devices such as the Apple iPad, HTC EVO 4G, and the Samsung Note. Moreover, local stores continue to proliferate throughout the country, which suggests that customers consider the local market relevant and important to their purchasing and servicing decisions. In analyzing potential harms arising from spectrum concentration in local geographic markets, the Commission has typically relied upon Cellular Market Areas (CMAs).[74] The Commission should continue to analyze spectrum acquisitions on a CMA-basis to evaluate local anti-competitive harms.[75]

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[70] *Id*. ¶ 30.
[71] *Id* (citing *AT&T-Qualcomm Order* ¶ 34).
[72] *Id*. ¶ 31 (citing *Verizon Wireless-SpectrumCo Order* ¶ 58).
[73] *See Verizon Wireless-SpectrumCo Order*, 27 FCC Rcd at 10719 ¶ 58.
[74] *NPRM* ¶ 30 (citing 47 C.F.R. § 22.909; *AT&T-Qualcomm Order*, 26 FCC Rcd at 17603 ¶ 32 n.96).
[75] *See, e.g., AT&T-Verizon Wireless Order* ¶ 46.

The Commission should also continue to analyze the potential anti-competitive effects of spectrum acquisitions at the national level. The aggregated harm at the local level can have a significant effect on the nationwide market.[76] Further, while there are local markets for retail mobile services, actual prices and service plan offerings are set at the national level. The Commission has also properly noted that advertising is directed at a national audience, and mobile equipment and devices are developed and deployed on a national scale.[77] The national market considerations for the mobile industry have not changed.

B. The Commission Should Define the Relevant Product Market as Including Mobile Voice and Broadband Services

The Commission should continue to define the relevant product market in its analysis of potential anti-competitive effects of spectrum acquisitions as a combined mobile voice and broadband services product market "comprised of mobile voice and data services, including mobile voice and data services provided over advanced broadband wireless networks."[78] The market for mobile broadband data services is rapidly changing, and defining the product market too narrowly by limiting the product market to only telephony or data risks preventing pro-competitive transactions that parties might enter.[79] Thus, while the Commission should remain vigilant about changes in the marketplace, the substantial and dynamic evolution of mobile

[76] *NPRM* ¶ 31 (citing *AT&T-Qualcomm Order*, 26 FCC Rcd 17603 ¶¶ 32, 34; *Verizon Wireless-SpectrumCo Order*, 27 FCC Rcd 10719 ¶ 58.).
[77] *Id* (citing *AT&T-Qualcomm Order*, 26 FCC Rcd 17605 ¶ 35; *Verizon Wireless-SpectrumCo Order*, 27 FCC Rcd 10718 ¶ 57).
[78] *Id*. ¶ 24 (citing *AT&T-Qualcomm Order*, 26 FCC Rcd at 17602-03 ¶¶ 32-33; *Verizon Wireless-SpectrumCo Order*, 27 FCC Rcd 10717 ¶ 53; AT&T Inc. and CellCo Partnership *d/b/a* Verizon Wireless Seek FCC Consent to Assign or Transfer Control of Licenses and Authorizations and Modify a Spectrum Leasing Arrangement, *Memorandum Opinion and Order*, WT Docket No. 09-104, 25 FCC Rcd 8704, 8721 ¶35 (2010); *AT&T-Centennial Order* ¶ 37).
[79] *See e.g.* Applications of Cellco Partnership *d/b/a* Verizon Wireless and Atlantic Holdings LLC For Consent to Transfer Control of Licenses, Authorizations, and Spectrum Manager and *De Facto* Transfer Leasing Arrangements and Petition for Declaratory Ruling that the Transaction is Consistent with Section 310(b)(4) of the Communications Act, *Memorandum Opinion and Order and Declaratory Ruling*, WT Docket No. 08-95, File Nos. 0003463892, *et al*., ITC-T/C-20080613-00270, *et al*., File No. ISP-PDR-20080613-00012, FCC 08-258 ¶ 45 (rel. Nov. 10, 2008).

services currently cautions against an overly narrow interpretation of the relevant product market.

C. The Commission Should Leave Open the Possibility of Band-Specific Spectrum Limits for Any Particular Proposed Auction

The Commission should leave open the option of adopting band-specific aggregation limits for specific auctions. As the Commission continues to work to free new spectrum and as the market continues to develop new technology, certain spectrum may prove too important to the market to leave in the hands of one or two market participants. A band-specific rule would ensure wider market participation. Other countries, such as Canada, have adopted band–specific spectrum-aggregation limits for new auctions to encourage innovation, stimulate price competition, and preserve a vibrant market for future spectrum auctions.[80] These determinations are necessarily made on a case-by-case basis, but the Commission should remain open to band-specific limits in future auctions as it considers auction rules for individual bands.

VI. THE COMMISSION SHOULD ADOPT PRO-COMPETITIVE REMEDIES APPLICABLE TO ENTITIES THAT EXCEED THE SPECTRUM SCREEN

The Commission should continue its practice of adopting pro-competitive remedies when a transaction triggers the spectrum screen. The Commission successfully required spectrum divestitures when a proposed acquisition triggers the spectrum screen. Importantly, however, the Commission should ensure that such divestitures actually promote competition and do not simply transfer spectrum from one of the Twin Bells to the other. The spectrum divestiture must also ensure that "the spectrum to be divested . . . is immediately 'useable' by another licensee,

[80] *See* Industry Canada, *Policy and Technical Framework: Mobile Broadband Services (MBS) – 700 MHz Band & Broadband Radio Service (BRS) – 2500 MHz Band* (2012) available at http://xrl.us/bn2tzt (restricting the three largest carriers to one-quarter of the 700 MHz spectrum on the block in the upcoming auction).

perhaps for a particular technology."[81] Modern wireless deployments require considerable capital investment for each spectrum band deployed. A carrier with an established network infrastructure geared to one band generally cannot incorporate spectrum from an entirely different band into their base stations and user equipment without considerable planning, time, and expense. Spectrum, in short, is not a fungible resource. On the contrary, barriers to entry exist because the upfront economic investment to support the new band across the network population would far exceed the limited geographic area in which divested spectrum would be available.

To ensure use of divested spectrum, the Commission should examine the propagation characteristics of the spectrum and available technology that allows other carriers to use the spectrum as well as any regulatory impediments or interference issues. The Commission should also consult with market participants about whether they could use the spectrum effectively. And it should consider alternative divestiture approaches, such as the "clustered approach" that "would require divestitures of population centers to allow a prospective purchaser to offer a viable service and to minimize or prevent piecemeal divestiture."[82] These are exactly the types of actions the Commission "can adopt to facilitate spectrum being divested expeditiously to licensees that will put it to use quickly and efficiently."[83]

VII. ATTRIBUTION RULES SHOULD RECOGNIZE NON-ATTRIBUTABLE INTERESTS HIGHER THAN 10% IN APPROPRIATE CIRCUMSTANCES AND SHOULD REFLECT EVOLVING LEASING AND SHARING ARRANGEMENTS

[81] *NPRM* ¶ 45.
[82] *Id.* ¶ 44 (citing *Verizon Wireless-ALLTEL Order* ¶ 160).
[83] *Id.* ¶ 44 (citing *Verizon Wireless-SpectrumCo Order*, Statement of Commissioner Ajit Pai, approving in part and concurring in part, at 1).

Under the current spectrum screen, the Commission attributes spectrum to any company that holds a greater than ten percent interest in a license-holding company.[84] While the Commission has imposed ownership disclosure requirements for wireless licensees holding more than a ten percent ownership interest[85] and has conjectured about the potential for diminished competition between companies with common ownership of more than ten percent in a shared subsidiary, the Commission has never fully explained the rationale behind a ten percent limit for spectrum attribution purposes. The Commission should consider relaxing this attribution threshold.

In other contexts, the Commission has viewed ownership limits of twenty percent, twenty-five percent, or an even greater percentage as a threshold that indicates control. As the *Notice* explains, the CMRS cap and the Cellular cap looked at ownership interests of 20% or greater.[86] Similarly, in the *direct* foreign ownership context, the Commission looks at ownership interests of 20%.[87] And in the *indirect* foreign ownership context—where a foreign company owns a U.S. company that owns a company with a license—the relevant ownership interest is 25%.[88] Indeed, in analyzing both direct and indirect foreign ownership, the Commission has determined that it should use its forbearance authority to determine the relevant level of ownership.[89] The Commission has explained that relaxing the rules "provide[s] common carrier licensees and their potential owners with greater flexibility in how they choose to structure

[84] Applications for the Assignment of License from Denali PCS, LLC to Alaska DigitTel, LLC, *Memorandum Opinion and Order*, 21 FCC Rcd 14863 ¶ 45 (2006) ("[A]ll spectrum in which the merged entity would have a 10 percent or greater interest is attributed to that entity.").
[85] *See, e.g.*, 47 C.F.R. §§ 1.919(a) (requiring licensees to disclose ownership information); 1.2112(a) (requiring applicants seeking to participate in competitive bidding to disclose ownership information for ownership interests of 10% or greater).
[86] *NPRM* ¶ 41.
[87] 47 U.S.C. § 310(b)(3).
[88] *Id.* § 310(b)(4).
[89] *See* Review of Foreign Ownership Policies for Common Carrier and Aeronautical Radio Licensees under Section 310(b)(4) of the Communications Act of 1934, as Amended, *First Report & Order*, IB Docket No. 11-133 (rel. Aug. 17, 2012).

foreign investment in a licensee" while allowing the FCC to protect "national security and law enforcement interests."[90]

In the context of mobile spectrum attribution, certain ownership arrangements above 10% may not indicate any actual control. By allowing more flexible attribution rules, the Commission could encourage capital investment. The Commission has already recognized its "flexibility to examine equity and non-equity ownership and other interests that do not meet the ten percent equity interest threshold."[91] It should likewise recognize the desirability of departing from the ten percent threshold as a means of promoting capital investment.

Whatever the proper level of equity and voting interests at which spectrum becomes attributable to a non-controlling investor, the Commission should not allow its spectrum screen to frustrate new business models, such as wholesale operations, and new innovations, such as network sharing. In the *Notice*, the Commission recognized that long-term commercial leases give both lessors and lessees important control over the spectrum and proposed to make these arrangements attributable.[92] Rather than fall into the same one-size-fits-all pitfall as the current spectrum screen, the Commission should analyze the specific facts of the business arrangement in deciding whether or not to attribute spectrum to the parent company whenever spectrum capacity is sold on a wholesale basis or is shared. When deciding whether or not to attribute spectrum in the context of a sharing or wholesale arrangement, the Commission should consider

[90] *Id.* ¶ 2.
[91] *NPRM* ¶ 41.
[92] *Id.*, App'x A; *see, e.g.*, Applications of Midwest Wireless Holdings, L.L.C. and ALLTEL Communications, Inc., for Consent to Transfer Control of Licenses and Authorizations, File Nos. 0002391997, *et al*. and Application of Great Western Cellular Partners, L.L.C. and ALLTEL Communications, Inc., for Consent to Transfer Control of License, *Memorandum Opinion and Order*, 21 FCC Rcd 11526 ¶ 88 n.223 (2006); Applications of Cellco Partnership d/b/a Verizon Wireless and Rural Cellular Corporation For Consent to Transfer Control of Licenses, Authorizations, and Spectrum Manager Leases and Petitions for Declaratory Ruling that the Transaction is Consistent with Section 310(b)(4) of the Communications Act, *Memorandum Opinion and Order and Declaratory Ruling*, 23 FCC Rcd 12463 at Appendix B n.499 (2008); Application of SprintCom, Inc. and Alaska DigiTel, L.L.C. for Long-Term De Facto Transfer Spectrum Leasing Arrangement, *Memorandum Opinion and Order*, 24 FCC Rcd 435 ¶ 14 n.54 (2009).

how much capacity the license holder uses, who decides which providers can use the shared spectrum, and under what terms and conditions the capacity is offered. Open platform arrangements offered on a competitively neutral basis warrant less regulatory scrutiny than closed systems available through preferential or exclusive contracts. This type of context-based analysis in wholesale and sharing arrangements could promote competition- and efficiency-enhancing arrangements while continuing to prevent the excessive concentration of spectrum that could frustrate effective competition and harm consumers.

VIII. CONCLUSION

The Commission can and should promote competition in the wireless market by enhancing the analytical tools it uses to prevent excessive concentration of spectrum resources in the dominant providers of wireless voice and data services. First, refining the current spectrum screen to more accurately reflect the spectrum used and useful for mobile voice and data services will enhance the current screen's ability to serve as a diagnostic tool for potentially anti-competitive spectrum acquisitions. Second, supplementing a refined all-inclusive screen with an additional spectrum screen focused exclusively on the most valuable and useful spectrum holdings below 1 GHz will limit the opportunities for incorrectly identifying competitive concerns where none exist or wrongly passing on transactions that warrant additional scrutiny. Third, updating the attribution rules to better reflect evolving leasing and spectrum-sharing arrangements will promote competition while protecting against excessive concentration. With each of these measures, the Commission needs to act expeditiously to prevent further spectrum concentration in the two dominant carriers and should adopt affirmative measures to help restore

effective competition in the commercial mobile markets prior to the next commercial mobile services spectrum auction.

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