Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz for Mobile Radio Services	)	GN Docket No. 14-177
	)	
Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	ET Docket No. 95-183 (Terminated)
	)	
Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	PP Docket No. 93-253 (Terminated)
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664

REPLY COMMENTS OF
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
AND PUBLIC KNOWLEDGE

New America's Open Technology Institute ("OTI") and Public Knowledge ("PK") submit these Reply Comments in response to the Commission's *Notice of Inquiry* concerning the use and appropriate allocation of spectrum in the bands above 24 GHz.[1] OTI & PK appreciate the Commission's forward-looking initiative to anticipate the development of technologies that will make these millimeter wave bands useful for the provision of high-capacity mobile data service. As consumer advocates, our groups agree the Commission should extend the balanced approach exemplified in the agency's proposed 3.5 GHz band Citizens' Broadband Radio Service and ensure that there is an appropriate mix of licensed, unlicensed, and particularly

[1] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Notice of Inquiry, 29 FCC Rcd 13020 (2014) ("*NOI*").

hybrid approaches that ensure spectrum allocations promote opportunistic access, intensive small cell re-use, innovation, market entry, and competition.

The ongoing densification of networks – and the increasing shift toward small cells and unlicensed technologies to offload surging mobile device data traffic – does indeed suggest that these bands can help to meet the public's need for more ubiquitous and affordable high-capacity connectivity. The realities of the propagation characteristics of high-frequency bands is that their benefit to consumers will rarely be to increase coverage or truly "mobile" use (on the go); rather, these bands are well suited to enhance the density and capacity of networks (self-provisioned as well as carrier-provisioned) for the increasingly dominant use of mobile devices on a nomadic basis (indoors in the home, office, public spaces, or otherwise very close to wireline backhaul). As a result, we strongly agree with the commenting parties who emphasize unlicensed and hybrid approaches to accessing these spectrum bands that, at a minimum, make unused capacity available for opportunistic access on a use-it-or-share-it basis whenever feasible.

I. A Balanced Approach that Includes Licensed, Unlicensed and Dynamic Spectrum Sharing is Most Appropriate for Bands Above 24 GHz and Will Best Serve the Public Interest in Innovation, Open Access and Competition

As a starting point, it is critical that the Commission not allocate spectrum rights to utilize the bands above 24 GHz (or even the bands above 5 GHz) in a manner that "extend[s] . . . the status quo" that developed on low-frequency bands using exclusive licensing and technologies more oriented toward wide-area coverage than to small area capacity enhancement.[2] Rather, OTI & PK concur with Verizon that "[a]s the Commission has recognized, including in the 3.5 GHz proceeding, it is a false choice to assume that all spectrum must either be 'licensed' or

[2] *NOI* at ¶ 92 (describing "Option 1" as "auctioning exclusive rights to geographic service areas").

'unlicensed.'"[3] Although Verizon asserts its historic preference for the "clearing-and-auctioning model for lower frequencies," we agree with the company's admonition that the Commission "should be open to other frameworks for the upper frequencies." Among these frameworks, Verizon observes, may be "aspects of a 'use it or share it' licensing framework, such as what is being explored in the 3.5 GHz proceeding."[4]

OTI & PK strongly agree with the majority of commenters that high-frequency bands are especially suitable for unlicensed use and dynamic sharing – and not primarily for traditional exclusive licensing on a geographic basis.[5] First, as Google correctly emphasizes, the Commission acknowledges that "most of the candidate bands above 24 GHz are already shared and, most likely, will continue to be shared by other services."[6] Federal-commercial coordination is already well-established in several of the listed bands, including the open access and lightly-licensed database management coordination that governs private sector access to the 70, 80 and 90 GHz bands today.[7]

OTI & PK disagree with Qualcomm's contrary view that the Commission "should consider clearing bands above 24 GHz for mobile use," and exclusive licensing, because "requiring new mobile operations to work around the current incumbent users in a given band

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[3] Comments of Verizon, Notice of Inquiry, GN Docket No. 14-177 at 3 (Jan. 15, 2015).
[4] *Id*. at 4. *See also* Comments of T-Mobile USA, Inc., Notice of Inquiry, GN Docket No. 14-177 at 8 (Jan. 15, 2015) ("Comments of T-Mobile") ("[I]f the FCC determines that exclusive licensing is not feasible for all of the spectrum under 60 GHz, the FCC could explore a 3-tiered dynamic spectrum access system for use of this band").
[5] *See, e.g.*, Comments of Google, Notice of Inquiry, GN Docket No. 14-177 at 7-9 (Jan. 15, 2015) ("Comments of Google"); Comments of National Cable & Telecommunications Assn, Notice of Inquiry, GN Docket No. 14-177 at 6, 9 (Jan. 15, 2015) ("Comments of NCTA"); Comments of Consumer Electronics Assn, Notice of Inquiry, GN Docket No. 14-177 at 13 (Jan. 15, 2015) ("Comments of CEA"); Comments of Wi-Fi Alliance, Notice of Inquiry, GN Docket No. 14-177 at 4 (Jan. 15, 2015) ("Comments of Wi-Fi Alliance");
[6] *NOI* at ¶ 46; Comments of Google at 7.
[7] *See Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corp. Petition for Rulemaking*, Report and Order, 18 FCC Rcd. 23318, ¶ 40 (2003).

could limit the feasibility of supporting mobile services in these millimeter frequency bands."[8] Of course, that is yet another problem with exclusive licensing: it requires the time, expense, and the availability of alternative spectrum bands needed to relocate incumbents. While the multi-year and multi-billion process that led to clearing 25 MHz of mid-band federal spectrum for the recent AWS-3 auction may have been feasible and worth the cost (both in money and time), that is far less likely to be true for the bands above 24 GHz. As the Commission has already recognized in the 3.5 GHz proceeding – and as the President's Council of Advisors on Science and Technology (PCAST) has proposed more generally[9] – bands occupied by incumbents can be most immediately and effectively utilized with a hybrid approach that includes opportunistic and unlicensed access on a small cell, relatively low-power basis.

Second, the unique propagation characteristics of millimeter wave spectrum suggest that unlicensed and dynamic sharing approaches would be the most efficient and innovative access regimes. In addition to its current occupancy, millimeter wave spectrum is nothing like the low-band spectrum used intensively by carriers on an exclusive basis for wide-area coverage and at least partial building penetration. As the Consumer Electronics Association (CEA) observed, in millimeter wave spectrum "both heavy rain and foliage can significantly reduce signal penetration and strength," and can at best "serve a supplemental role for [mobile] service providers in urban areas" if deployments are sufficiently dense.[10] With the exception of certain point-to-point backhaul uses, the use of millimeter wave spectrum above 24 GHz for so-called

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[8] Comments of Qualcomm Incorporated, Notice of Inquiry, GN Docket No. 14-177 at 7, 8 (Jan. 15, 2015) ("Comments of Qualcomm").

[9] President's Council of Advisors on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, Executive Office of the President (rel. July 20, 2012) ("[c]learing and reallocation of Federal spectrum for exclusive use is not a sustainable basis for spectrum policy due to the high cost, lengthy time to implement, and disruption to the Federal mission").

[10] Comments of CEA at 13, citing FCC Technology Advisory Council, Summary of Meeting at 60-61, Spectrum Frontier Working Group Presentation at Slide 5-6 (Dec. 9, 2013), *available at* . https://www.fcc.gov/encyclopedia/technological-advisory-council. *See also* Comments of NCTA at 6.

"mobile" broadband data services is inherently a dense, small cell undertaking likely to be deployed in geographically limited and densely-populated areas.

Google correctly states that although millimeter wave bands are not a good fit for a wide-area exclusive-licensing model, "the propagation and atmospheric absorption characteristics of these bands make them well-suited to line-of-sight operations that can be mapped and protected with relative ease."[11] Coordination mechanisms well suited to millimeter wave spectrum sharing include a database management system similar to what is already in use to authorize opportunistic sharing of the 70/80/90 GHz band with Federal agencies, or the Spectrum Access System the Commission has proposed to certify to coordinate dynamic sharing among federal agencies, licensed and unlicensed users at 3550-3700 MHz.[12]

Central to the sort of hybrid approach the Commission has proposed for efficient small-cell spectrum re-use in the 3.5 GHz proceeding is *opportunistic access to unused spectrum capacity*. In the *NOI* the Commission asked whether it should allow secondary unlicensed operations in bands that it allocates to licensed mobile services.[13] OTI & PK concur with the parties observing that millimeter wave spectrum is particularly well suited to accommodating opportunistic access by unlicensed operations. NCTA correctly points out that the limited propagation of millimeter wave spectrum means "the possibilities for spectrum re-use will be greater than in lower frequencies."[14] As the Commission recognized, network operators, including licensed users, will use these high-frequency bands strategically to deploy small cells that complement lower-frequency operations. We agree with NCTA that a "keep-what-you-are-using" approach to licensing could make sense – perhaps modeled after the "lightly-licensed"

[11] Comments of Google at 8.
[12] *See, e.g.,* Comments of CEA at 14 ("CEA supports the principles underlying the innovative real-time, database driven sharing regimes being proposed in the 3.5 GHz band"); Comments of Wi-Fi Alliance at 8.
[13] *NOI* at ¶¶ 95, 101.
[14] Comments of NCTA at 6.

open registration approach used now for 70/80/90 GHz point-to-point operations[15] – whereas wide-area exclusive licensing would result in underutilized spectrum and "vast swaths of territory unserved by licensed operations."[16]

II. The Commission Should Reject Proposals to Immediately Reallocate any of the Candidate Bands Above 24 GHz for Exclusive Licensing

All of the same reasons described in the section above also lead OTI & PK to strongly oppose Qualcomm's premature and misconceived recommendation that the Commission should "promptly issue band-specific *Notices of Proposed Rulemaking* proposing to exclusively license for mobile broadband services large blocks of spectrum currently assigned to the LMDS, 39 GHz and 37/42 GHz services."[17] CTIA similarly, though far more generically, proposes that the Commission "should seek to use exclusive licensing for bands above 24 GHz as much as practicable."[18] While OTI & PK do not take a position at this time on the specific regulatory access regime that should govern each of these bands in the future, exclusive licensing on a geographic area basis would seem to be the *least* conducive to the public interest in widespread and intensive spectrum re-use, lower market barriers to entry, promoting mobile market competition, stimulating innovation, and generally giving the largest possible number of businesses and individuals the ability to self-provision capacity for mobile data offload, the emerging Internet of Things, and other connectivity needs.

While exclusive use spectrum in bands below 3 GHz continues to have a role to play in supporting coverage and truly mobile connectivity ("on the go"), it has proven utterly incapable

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[15] *See Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands; Loea Communications Corp. Petition for Rulemaking*, Report and Order, 18 FCC Rcd. 23318, ¶ 40 (2003).
[16] *Id.* at 6-7.
[17] Comments of Qualcomm at ii, 16.
[18] Comments of CTIA, Notice of Inquiry, GN Docket No. 14-177 at 9 (Jan. 15, 2015).

of meeting the public's demand for ubiquitous, high-capacity wireless connectivity at affordable prices. Surging consumer demand for data on mobile devices, especially smartphones and tablets, is primarily nomadic and can be most efficiently met by offloading data traffic onto *wired* local area networks (such as home or business Wi-Fi connections), rather than relying on transmission over exclusively-licensed spectrum to more distant carrier-provisioned infrastructure. Small cell spectrum re-use – and Wi-Fi offloading of mobile device data traffic onto local area wireline networks – already carries a majority of mobile device data traffic in the U.S.[19] Analysts expect Wi-Fi offloading to grow. A European Commission study projects Wi-Fi offload will rise to around 80 percent of mobile device traffic in major EU nations within a few years.[20] Both spectrum re-use and backhaul will increasingly be more cost-effective at the edge of the network, closest to the end-user and subject to their control (or, more practically speaking, determined on the fly by software in their device).

III. Open a Rulemaking to Consider Extending Part 15 Unlicensed Authorization to the 64-71 GHz Band and Above as Feasible

OTI & PK agree with commenters that support a rulemaking to extend the Part 15 operations currently permitted in the 57-64 GHz band to the adjacent 64-71 GHz band immediately above.[21] As the Commission notes, there are currently no licensed operations across this entire 14 GHz of spectrum. In 2013 the Commission raised the power limits and generally

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[19] Cisco, *Visual Networking Index: VNI Mobile Forecast Highlights, 2014–2019,* available at http://www.cisco.com/assets/sol/sp/vni/forecast_highlights_mobile/index.html#~Country ("57% of the United States's mobile data traffic was offloaded in 2014. 66% of the United States's mobile data traffic will be offloaded by 2019.")

[20] J. Scott Marcus and John Burns, *Study on the Impact of Traffic Off-Loading and Related Technological Trends on the Demand for Wireless Broadband Spectrum*, European Commission (August, 2013), at 3, 57. *See also* Comments of NCTA at 7-8 (describing the cable industry's more than 10 million Wi-Fi hotspots and billions of subscriber sessions on mobile devices).

[21] *See* Comments of Wi-Fi Alliance at 4-6; Comments of Qualcomm at 14.

expanded the utility of the 57-64 GHz unlicensed band. OTI & PK agree that it would be a positive step forward to initiate a rulemaking to extend this authorization to the entire "Extended 60 GHz Band" (57-71 GHz).

Wi-Fi Alliance points out that this expansion would double the number of possible channels available for WiGig technologies using the IEEE 802.11ad standard, permitting information transfers between devices at up to seven gigabits per second.[22] A wider band would support denser deployments and increased data rate capacity. Because of the very short transmission ranges at that frequency – and because most expected use would be indoors – OTI & PK agree that authorizing use of the entire Extended 60 GHz Band under the existing Part 15 rules would best serve the public interest in open access, very high-capacity spectrum for data transfers.

The record indicates little if any disagreement with this proposal, even among mobile carrier interests that otherwise advocate for the exclusive licensing of bands below 60 GHz.[23] We therefore agree with Qualcomm's recommendation that "[t]he Commission should promptly issue a NPRM proposing to expand the current 60 GHz unlicensed band (i.e., the 57 to 64 GHz band) to include the 64 to 71 GHz band identified in the NOI."[24]

[22] Comments of Wi-Fi Alliance at 4-5.
[23] *See, e.g.*, Comments of T-Mobile at 7.
[24] Comments of Qualcomm at 14.

CONCLUSION

Open, shared and opportunistic access to small cell spectrum is a proven success in the Part 15 bands where Wi-Fi offload and other wireless innovation is booming. OTI & PK agree with commenters suggesting that the Commission should extend the balanced approach exemplified in the agency's proposed 3.5 GHz band Citizens' Broadband Radio Service and ensure that there is an appropriate mix of licensed, unlicensed and hybrid (three-tier) approaches to band sharing. This balanced approach, avoiding exclusive geographic area licensing above 24 GHz, best serves the public interest by promoting widespread opportunistic access, intensive small cell re-use, innovation, market entry, and competition.

Respectfully Submitted,

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