

**Before the  
Federal Communications Commission  
Washington, D.C. 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 AT&T**

AT&T Services Inc. (“AT&T”) hereby submits the following reply comments in response to the Federal Communications Commission’s (“Commission”) Notice of Inquiry (“NOI”) in the proceeding<sup>1</sup> captioned above.

The FCC is to be applauded for taking this important step in the development of future communications services. Evidence of the industry’s concurrence in this action can be seen in its overwhelming support for the Commission’s proposal to examine the possible uses of millimeter wave (“mmW”) bands for mobile use. Indeed, almost all of the comments noted that this study takes place within the context of broader efforts to develop technical standards for Fifth Generation (“5G”) mobile services, which commenters agree will require additional spectrum to meet

---

<sup>1</sup> See *In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, Notice of Inquiry, FCC 14-154 (October 14,, 2014) (“NOI”).

customers' continuing demand for greater bandwidth and faster wireless network speed. These greater bandwidths and faster speeds will provide the raw material for the 5G mobile network that will transform the notion of connectivity.

The fifth generation of mobile technology (5G) is positioned to address the demands and business contexts of 2020 and beyond, that is, to enable a fully mobile and connected society and to empower socio-economic transformations in countless ways many of which are unimagined today, including those for productivity, sustainability and well-being. The demands of a fully mobile and connected society are characterized by the tremendous growth in connectivity and density/volume of traffic, the required multi-layer densification in enabling this, and the broad range of use cases and business models expected.<sup>2</sup>

To move mobile communications to this transformative state, the FCC, for the first time, will seek to exploit spectrum above 24 GHz for mobile service in addition to the frequency bands currently in use. In this regard, the NOI focuses its attention on frequency bands above 24 GHz in an effort to discover what bands may be suitable for mobile services, and to begin developing a record on mobile service rules and a licensing framework for mobile services in those bands.

AT&T strongly supports the Commission's on-going efforts to identify more spectrum for use by mobile services. This is a necessary step if the North American wireless industry is to be in the forefront of the creation of 5G services. With some measures showing American investment in information and communications technology ("ICT") lagging<sup>3</sup>, there is reason for concern that North American leadership in ICT, which created the wireless revolution,<sup>4</sup> will not

---

<sup>2</sup> Next Generation Mobile Networks Alliance ("NGMN"), "5G White Paper - Executive Version" at 4 (December 22, 2014).

<sup>3</sup> See, Comments of NYU Wireless at p. 8 and following.

<sup>4</sup> Analog cellular service, known as Advanced Mobile Phone Service ("AMPS"), was proposed by AT&T in the late 1960s. In 1970, the FCC allocated spectrum for AMPS. However, regulatory disputes dragged on for 13 years before commercial AMPS began in the United States. By then, Scandinavia (and Saudi Arabia) already offered cellular service. As a result, small, local Nordic telephone companies like Ericsson and Nokia became industrial giants. See, n.5 below. See also, *In the Matter of An Inquiry Relative To The Future Use Of The Frequency Band 806-960 MHZ; And Amendment Of Parts 2, 18, 21, 73, 74, 89, 91, And 93 Of The Rules Relative To Operations In the Land Mobile Service Between 806 And 960 MHZ*, Second Report and Order,

be carried into 5G. While the academic research programs in the US represent a significant investment, much more is needed to achieve significant breakthroughs, and to keep pace with the funding levels and research activities in other parts of the world. The failure of the United States to become a major player in 5G would result in the country losing its technological leadership, potentially putting the region at an economic disadvantage, and leaving the direction and definition of 5G to be driven and controlled by European and Asian interests.<sup>5</sup> Clearly, a concerted and planned effort on the part of industry, academia, and governmental agencies is required to maintain the United States' leadership role in this key technology area. This is critical to ensure the United States' competitiveness in global markets. By developing an effective spectrum policy, the FCC can encourage private capital formation that will pursue these goals and develop new 5G wireless technologies that will benefit US consumers.

**1. The Commission Should Adopt a Broad View of 5G Services.**

As heartening as the Commission's search for usable spectrum above 24 GHz is to AT&T and others, there is still a pressing need for additional spectrum in the lower frequency bands, and AT&T urges the Commission not to lose focus on that search. Like many of the commenters, AT&T believes 5G should be seen as a new network from end-to-end, harnessing both evolutionary as well as revolutionary technologies. Unlike 2G, 3G and 4G air interfaces, 5G will be a heterogeneous environment of networks relying on a variety of spectrum bands and

---

46 F.C.C.2d 752 (May 2, 1974) at ¶ 5; <http://www.nytimes.com/1982/02/22/business/fcc-ready-to-issue-cellular-radio-orders.html>.

<sup>5</sup> In 1997, Professor Jerry A. Hausman of MIT estimated that the more than 10-year delay in the introduction of cellular telephone service cost American consumers \$100 billion. *Valuing the Effect of Regulation on New Services in Telecommunications*, available at [http://www.brookings.edu/~media/Projects/BPEA/1997%20micro/1997\\_bpeamicro\\_hausman.PDF](http://www.brookings.edu/~media/Projects/BPEA/1997%20micro/1997_bpeamicro_hausman.PDF).

technologies for its operation. This means that spectrum below 6 GHz remains vital for future wireless growth.

5G standards activity will begin in early 2016 with the expected publication of the Third Generation Partnership Project (“3GPP”) Release 14, which will propose wider LTE bandwidth, LTE and Wi-Fi aggregation, and LTE optimization up to 6 GHz allowing for backward compatibility with existing LTE networks and services. This will be followed by Release 15; the first phase of ‘The Real 5G’ with completion expected between 2018 and 2020. Release 15 will propose LTE enhancements to meet most of the 5G requirements and will itself be the first 5G version. It will initially operate at frequencies below 6 GHz, which means that the FCC’s efforts to identify spectrum for 5G services must look at frequencies below 6 GHz as well as the much higher frequencies that are the subject of this NOI.

**2. Action by the FCC to Spur Private Capital Formation Can Help the Development of 5G.**

Currently, there is no formal US 5G initiative. By contrast, the European Union, China, Korea, and Japan all have national 5G programs.<sup>6</sup> For an American effort to coalesce, several things need to happen. The FCC has already taken the first step with the NOI. The Commission can aid the domestic creation of private capital formation for 5G, an essential step, by implementing an effective spectrum regime that provides investors with certainty and developmental flexibility. There are other steps it can take. For example, the FCC can recommend that 5G research and development funding be a part of the administration’s focus to expand wireless ac-

---

<sup>6</sup> NOI at § 9.

cess,<sup>7</sup> and it can urge Congress to enact the spectrum policy goals and regulatory reforms noted in a 2014 report to that body.<sup>8</sup>

A key part of deploying new spectrum for 5G lies in the rules that will govern its use. Long-standing Commission policies have benefited the development of wireless systems over the last three decades. The FCC should continue to strive for the most efficient use of spectrum. As amply demonstrated with other mobile wireless broadband band services, an exclusive licensing regime provides the greatest certainty and efficiency in the use of the spectrum. Exclusive licensing should be the preferred means of authorizing use of spectrum bands. Notwithstanding the effectiveness of exclusive licensing, AT&T recognizes that licensing of this kind is not possible in some instances. In such cases, the FCC should focus on all spectrum types – licensed, unlicensed and shared access.<sup>9</sup>

The recently concluded auction for AWS-3 spectrum illustrates how a flexible and creative approach to spectrum licensing can create new opportunities. A major user of this band is the federal government itself, especially the Department of Defense. By adopting rules that tran-

---

<sup>7</sup> See, “President Obama Details Plan to the Future Through Expanded Wireless Access,” (February 10, 2011) available at <http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access>

<sup>8</sup> Congressional Research Service (“CRS”), *Mobile Technology and Spectrum Policy: Innovation and Competition* by Linda K. Moore (September 30, 2014) R43595 at 25-26.

Policy challenges created by the rapid evolution of wireless technologies that Congress may decide to consider include the following:

- Developing spectrum policy goals beyond meeting immediate needs for mobile broadband.
- Identifying transitional opportunities for spectrum assignment and allocations.
- Improving the application process and reducing the cost of obtaining certification for unlicensed devices.
- Removing regulatory barriers to the development of flexible infrastructure.
- Aligning spectrum access policies with policies governing Internet access.
- Permitting technology to evolve while also balancing regulatory needs to achieve desired policy goals.

<sup>9</sup> This would include the use of a Spectrum Access System or equivalent when warranted.

sitioned federal use out of the band and provided for a spectrum-sharing arrangement for the remaining federal operations, the FCC made available significantly more spectrum for Advanced Wireless Services (AWS).<sup>10</sup> Similarly, in the 3.5 GHz band, the Commission sought industry comment on the use of a “sensing and sharing” mechanism whose goal is to permit the operation of radar installations while communications providers also make use of the spectrum.<sup>11</sup> These Commission Acts are critical stepping stones toward a spectrum policy that will make 5G possible.

Like others in the industry, AT&T expects 5G to provide speeds and capacity many times greater than advanced LTE and to do so at lower cost. To achieve these results will require wide channels to support traffic demands, particularly in dense urban areas and event venues. Similar to large band size, large contiguous blocks permit licenses to have the bandwidth to provide higher peak data rates. AT&T also urges the Commission, to the greatest extent possible, to ensure that the spectrum allocations to support 5G wireless mobile broadband use are internationally harmonized. Harmonization reduces equipment cost, allows for greater economies of scale, and makes use of the service outside of the United States more accessible. In this regard, AT&T encourages the FCC to propose adding an agenda item to WRC-18 for adding a mobile services classification for 5G in spectrum above 6 GHz and particularly in the spectrum above 24 GHz.

**3. With many technical issues remaining to be solved, the Commission should not enact technical rules at this time.**

In its comments, Samsung notes the efforts underway to develop technologies to support millimeter wave services. Samsung points out, for example, that as cells become smaller so as to

---

<sup>10</sup> Coordination Procedures In the 1695-1710 MHz AND 1755-1780 MHz Bands, Public Notice (July 18, 2014) DA 14-1023 at 1.

<sup>11</sup> *In the Matter of Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Notice of Proposed Rulemaking and Order, GN Docket No. 12-354 (December 12, 2012).

increase cell capacity, the use of higher frequencies presents increased problems for coverage and link budgets. In the same way, techniques to increase the signal-to-noise ratio, like beam-forming or phased antenna arrays, require still more development for effective operation.<sup>12</sup> Precipitate rulemaking on these and other technical matters by the Commission could interfere with the timely commercial deployment of 5G service. Indeed, Ericsson seconds this cautious approach in its comments on the NOI. There, the company argues that the Commission should consider a “phased approach” and focus on all bands below 30 GHz – particularly those below 6 GHz – in order to facilitate the near-term implementation of the 3GPP’s Release 15. Thereafter, Ericsson proposes consideration of the higher frequency band.<sup>13</sup> Nokia, too, supports this near-term focus on the 2 GHz to 6 GHz to assure the rapid deployment of 5G as it is anticipated to be described in Release 15. As the technology evolves, very high-capacity cells employing spectrum above 24 GHz and operating at the edge of the 5G system will become possible, providing data rates on the order of 10 Gbps.<sup>14</sup>

It is not, of course, simply a matter of piling lots of spectrum on a network to achieve these goals. 5G standardization will force manufacturers to develop a heterogeneous array of devices, sensors, backhaul transport, access points, content delivery mechanisms compression tools, and the like. Indeed, a holistic view of the process is required on the part of all if these networks are, for example, to provide much greater throughput, much lower latency, ultra-high reliability, much higher connectivity density, and higher mobility range where required. Clearly, great technical challenges remain to be overcome before the promises of 5G services can be realized. Still, with prudent steps by all parties to this process – industry, government, and research

---

<sup>12</sup> Comments of Samsung at 20-25.

<sup>13</sup> Ericsson Comments at 13-14.

<sup>14</sup> Nokia Comments at

– transformative mobile data speeds and services unimaginable just a few years ago will become commonplace.

In concert with most of the commenters to this NOI, AT&T therefore urges the Commission to focus on the necessity of identifying spectrum suitable for 5G services and by promoting research and development investment in 5G. Given the ample lead time for 5G deployment, the FCC can make a significant contribution to the 5G global rollout by championing a mobile allocation to spectrum above 24 GHz at the WRC-15 and by encouraging opportunities for harmonization of bands and services at the World Radio Conferences.

As the earliest form of 5G will occur in frequency bands below 6 GHz, the near-term spectrum needed for 5G is not only the spectrum above 24 GHz, but also the spectrum located below 6 GHz. AT&T supports the NOI's goal of identifying spectrum above 24 GHz for use in offering 5G services. At the same time, AT&T urges the Commission to keep in mind the need for spectrum below 6 GHz if 5G services are to begin commercial service by 2020.

## CONCLUSION

The millimeter wave bands identified in the NOI present an important opportunity to open large contiguous blocks of spectrum to meet today's surging mobile broadband data demands, particularly in major metropolitan areas and event venues where large populations of mobile users are concentrated. AT&T expects that 5G services will use more than just these millimeter wave bands, however. AT&T envisions 5G services using low band, medium band, and high band spectrum in concert with one another to deliver connectivity not supportable with current mobile wireless technology. In AT&T's view, the Commission should also look at bands below 6 GHz and between 6 and 24 GHz, as these are the bands in which 5G services are expected to emerge first, before extending to bands at 24 GHz and higher. This lower band spectrum will continue to be essential to providing ubiquitous coverage due to its favorable propagation, which will enable country-wide access to advanced 5G services

Respectfully submitted,



By: William L. Roughton, Jr.  
Michael Goggin  
Gary L. Phillips  
Lori A. Fink  
1120 20th Street, N.W.  
Suite 1000  
Washington, D.C. 20036  
(202) 457-2040  
*Counsel for AT&T Services, Inc.*

February 18, 2015