



Perspectives from FSF Scholars
March 31, 2020
Vol. 15, No. 15

Mid-Band 5G Spectrum: Can the Upper 6 MHz Band Help Close the Gap?

by

Andrew Long *

Introduction and Summary

5G mobile technology is critical to the achievement of numerous national priorities. And mid-band spectrum is essential to the timely and comprehensive deployment of 5G. The FCC currently plans to auction 70 MHz of Citizens Broadband Radio Service (CBRS) spectrum in the 3.5 GHz band this summer and, if all goes well, 280 MHz of C-band spectrum later this year. These are important initial steps. A report just released by CTIA, however, lays bare the cold, hard reality: the United States must move quickly to free additional mid-band spectrum just to keep pace with global rivals. And, lest we forget, the objective should be U. S. leadership, not mere participation, in the race to 5G.

A pending Commission rulemaking proceeding would allow unlicensed devices to share the entire 6 GHz band – a total of 1200 MHz – with incumbent licensees. There is no question that our wireless future demands the use of both licensed and unlicensed spectrum, the latter for Wi-Fi 6, which promises to significantly improve the speed, latency, and device density of wireless networking. However, allocating all of the 6 GHz band to unlicensed use at this time could foreclose the possibility of flexible licensed use of the upper portion of that band, as it would be extremely difficult (if not impossible) to return that horse to the barn. Given the big-picture

benefits that a spectrum-licensing regime offers – which include providing licensees with the proper incentives to invest efficiently in infrastructure and put finite resources to their best and highest use, empowering the FCC to conduct effective oversight of interference issues that arise, and contributing auction revenues to the U.S. Treasury – any decision to allow unlicensed devices access to additional spectrum therefore should be made only after thorough consideration.

Prudence therefore suggests a more modest, incremental approach here, one that allows unlicensed devices to share the lower portion of the 6 GHz band immediately, while investigation continues into the possibility of licensed use of its upper portion. Such a strategy has the virtue of making available more unlicensed spectrum quickly, while not foreclosing the Commission from considering the need for more licensed mid-band spectrum in conjunction with other proceedings which may (or may not) free additional spectrum for licensed use.

Mid-Band Spectrum and the Global Race to 5G

5G, the latest generation of mobile broadband technology, will play a determinative role in the nation's Twenty-First Century economy. At the moment, the U.S. is in a strong competitive position vis-à-vis its global rivals: a report cited by FCC Chairman Ajit Pai during the Free State Foundation's recent Twelfth Annual Telecom Policy Conference, "Broadband Beyond 2020: Competition, Freedom, and Privacy," estimates that, by the end of 2020, "as many as three quarters of the world's 5G subscriptions would be found in just two countries: the United States and South Korea."¹

As the deployment of 5G ramps up, however, the ability of mobile providers to access mid-band spectrum (that is, between 3 GHz and 7 GHz) will become increasingly important. Often referred to as "Goldilocks spectrum," the mid band offers a just-right balance between geographic coverage and data speeds.² Unfortunately, at the moment there is no mid-spectrum available in the United States.

In his remarks at FSF's conference, Chairman Pai noted that, with respect to mid-band spectrum, at the time he assumed his current role "the cupboard was virtually bare."³ In response, he devised the "5G Fast Plan,"⁴ which already has produced results. Commissioner O'Rielly spearheaded the agency's effort to revise the CBRS rules and move forward with an auction,

¹ Remarks of Ajit Pai, Chairman of the FCC, at the Free State Foundation's "Broadband Beyond 2020: Competition, Freedom, and Privacy" Conference, Washington, DC (March 10, 2020), *citing* Press Release, "5G Connections to Reach 1.5 Billion Globally as US and South Korea Establish 5G Leadership," *Juniper Research* (January 13, 2020), available at <https://www.juniperresearch.com/press/press-releases/5g-connections-to-reach-1-5-billion-globally-2020>.

² By comparison, low-band spectrum offers greater range at the expense of speed, while high-band spectrum sacrifices geographic coverage for higher throughput. *See generally* Jeremy Horwitz, "The definitive guide to 5G low, mid, and high band speeds," *VentureBeat* (December 10, 2019), available at <https://venturebeat.com/2019/12/10/the-definitive-guide-to-5g-low-mid-and-high-band-speeds/>.

³ Remarks of Ajit Pai, Chairman of the FCC, at the Free State Foundation's "Broadband Beyond 2020: Competition, Freedom, and Privacy" Conference, Washington, DC (March 10, 2020).

⁴ *See generally* <https://www.fcc.gov/5G>.

initially scheduled for this June, of 70 MHz of spectrum in the 3.5 GHz band.⁵ However, "in order to protect the health and safety of Commission staff during the auction and so that parties have additional time to prepare ... given the COVID-19 pandemic," the agency just postponed the start of that auction by a month.⁶ Of course, the hope is that the auction will now take place in late July, but in the current environment, there is no certainty that it will.

In addition, the Republican majority adopted a *Report and Order* at the February Open Meeting reallocating 280 MHz in the C-band (3.7 to 3.98 GHz) to flexible licensed use.⁷ Barring potential legal challenges and any delay that might result,⁸ the C-band auction is scheduled to begin on December 8, 2020 – though, as with the 3.5 GHz auction, that date could slip as a consequence of the novel Coronavirus. Post-auction, should incumbent fixed-satellite service licensees meet the accelerated deadlines for band clearing, 100 MHz of mid-band spectrum will come online in December 2021, the remaining 180 MHz in December 2023.

While it is impossible to know for certain whether the auction schedules will hold, assuming for present purposes that they do, 350 MHz of mid-band spectrum for 5G is a good start – but it pales in comparison to the amount made available by other countries. On March 23, 2020, CTIA released a report prepared by Analysys Mason entitled "5G Mid-Band Spectrum Global Update."⁹ Some key takeaways:

- Currently in the U.S. there is no mid-band spectrum available for 5G. The successful auction of CBRS spectrum this summer will free 70 MHz. By comparison, at the end of 2020 Japan will have allocated 1000 MHz, the U.K. approximately 790 MHz, China 460 MHz, South Korea 280 MHz, and Canada 200 MHz.¹⁰
- The report compared the U.S. to thirteen other countries.¹¹ The per-country average amount of mid-band spectrum for 5G at the end of 2020 will be 382 MHz – more than five times the 70 MHz that will be available in the U.S.¹²

⁵ See Public Notice, *Auction of Priority Access Licenses for the 3550-3650 MHz Band; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auction 105; Bidding in Auction 105 Scheduled to Begin June 25, 2020*, AU Docket No. 19-244, FCC 20-18 (released March 2, 2020), available at <https://docs.fcc.gov/public/attachments/FCC-20-18A1.pdf>.

⁶ Public Notice, *Auction of Priority Access Licenses for the 3550-3650 MHz Band Rescheduled to Begin July 23, 2020; Auction 105 Short-Form Application Deadline Postponed to May 7, 2020*, AU Docket No. 19-244, DA 20-330 (released March 25, 2020), available at <https://docs.fcc.gov/public/attachments/DA-20-330A1.pdf>.

⁷ See *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Report and Order and Order of Proposed Modification, GN Docket No. 18-122, FCC 20-22 (released February 28, 2020), available at <https://docs.fcc.gov/public/attachments/FCC-20-22A1.pdf>.

⁸ See, e.g., John Eggerton, "Divided FCC Votes to Proceed with C-Band Auction," *Multichannel News* (February 28, 2020), available at <https://www.multichannel.com/news/divided-fcc-votes-to-proceed-with-c-band-auction> ("This Order is fatally flawed by its misinterpretations of the Communications Act, and by its numerous arbitrary and capricious conclusions," said ABS Global Chairman Jim Frownfelter. "The Small Satellite Operators (SSOs) are going to be harmed by the unlawful revocation of the right to use 60% of their licensed C-band spectrum, and we will ask the courts to overturn this Order and to instruct the FCC to start the entire process again.").

⁹ Janette Stewart, et al., "5G Mid-Band Global Update," *Analysis Mason* (March 2020), available at <https://www.ctia.org/news/report-5g-mid-band-spectrum-global-update> (*Analysis Mason Report*).

¹⁰ *Analysis Mason Report* at 2.

¹¹ Those countries are Australia, Canada, China, France, Germany, Hong Kong, Italy, Japan, Qatar, South Korea, Spain, Sweden and the United Kingdom. *Id.* at 1.

¹² *Id.* at 2.

- Even if reallocation of a portion of the C-band proceeds as planned and on schedule, at the end of 2022 the U.S. will find itself in tenth place with a total of 350 MHz, trailing Japan with 1000 MHz, the UK with roughly 790 MHz, South Korea with 600 MHz, Canada with 480 MHz, China and Hong Kong with 460 MHz, Germany and Qatar with 400 MHz, and Spain with 360 MHz.¹³
- By the end of 2022, the five countries with the most mid-band spectrum available for 5G (Japan, China, Canada, South Korea, and the U.K.) will have on average 660 MHz – nearly twice as much as the U.S. Just to match that figure the U.S. must come up with an additional 310 MHz, nearly double what is expected. And that would still leave the U.S. in third place overall, 340 MHz behind Japan and over 100 MHz short of the U.K.¹⁴

Without here vouching for the accuracy of every assertion in the new Analysys Mason report, there can be no other reasonable conclusion: if the United States is to prevail in the race to 5G, it must free additional mid-band spectrum. And it must do so quickly.

Both 5G and Wi-Fi 6 Will Play Critical Roles in Our Wireless Future

The future of wireless connectivity demands higher data rates, lower latency, support for an ever-increasing number of connected devices (*e.g.*, the Internet of Things), and decreased power consumption. 5G is how mobile broadband providers will deliver this functionality over licensed spectrum. And Wi-Fi 6, the latest version of the Wi-Fi technical standard, is how wireless local area networks will provide similar capabilities within homes and businesses using unlicensed spectrum, as I explained in a February 2020 FSF *Perspectives*.¹⁵

5G and Wi-Fi 6 thus promise complementary feature sets. Something else that they share: a need for additional spectrum. As set forth above, U.S. mobile broadband providers must have access to additional mid-band spectrum for 5G in order to keep pace on the global stage. Wi-Fi 6, meanwhile, requires unencumbered spectrum, and in particular contiguous 160 MHz wideband channels, in order to realize its full potential.

In terms of raw numbers, the FCC to date has proposed to make significantly more spectrum available for unlicensed use – 1245 MHz – than the prospective 350 MHz of mid-band spectrum for 5G discussed above. One pending *Notice of Proposed Rulemaking* would reallocate 45 MHz in the 5.9 GHz band to unlicensed use.¹⁶ As Randolph May, President of the Free State Foundation, and I explained in comments on that proposal submitted to the Commission, the 5.9 GHz band presents a clear opportunity to put a limited resource to its best and highest use quickly and with relative ease.¹⁷ The lower 45 MHz of that spectrum, which after twenty years

¹³ *Id.*

¹⁴ *Id.*

¹⁵ See Andrew Long, "Wi-Fi 6E Can Modernize Unlicensed Wireless," *Perspectives from FSF Scholars*, Vol. 15, No. 7 (February 7, 2020), available at <https://freestatefoundation.org/wp-content/uploads/2020/02/Wi-Fi-6E-Can-Modernize-Unlicensed-Wireless-020720.pdf>.

¹⁶ See *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, Notice of Proposed Rulemaking, FCC 19-129 (released December 17, 2019), available at <https://docs.fcc.gov/public/attachments/FCC-19-129A1.pdf>.

¹⁷ See generally Comments of the Free State Foundation, *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138 (submitted March 6, 2020), available at <https://freestatefoundation.org/wp-content/uploads/2020/03/FSF-Comments-5.9-GHz.Final-030620.pdf>.

has failed to realize its potential to improve automobile safety, could be combined with adjacent capacity in the 5 GHz band to create the first 160 MHz channel unburdened by interference-avoiding (and performance-degrading) measures.

Another open proceeding would allow unlicensed devices to share the entire 1200 MHz of spectrum in the 6 GHz band with incumbent licensees. Unlicensed use of just some of the 6 GHz band would facilitate additional 160 MHz channels for next-generation Wi-Fi, a possibility so appealing to the Wi-Fi community that it has come up with unique branding – "Wi-Fi 6E" – to identify specifically those devices capable of operating in that band.¹⁸

America's Global Competitive 5G Position Suggests a More Deliberate Approach to the 6 GHz Band

As the Analysys Mason report makes clear, compared to its global competitors in the race to 5G, the U.S. at present simply does not have sufficient mid-band spectrum in the pipeline. The Commission therefore must prioritize efforts to identify additional sources of mid-band spectrum. One possibility is the 3.1-3.55 GHz band. In December 2019, the FCC adopted a *Notice of Proposed Rulemaking* addressing the removal and relocation of non-federal licensees, "which would be the first step to making spectrum in this band available for advanced commercial services, including 5G."¹⁹

Another is the upper portion of the 6 GHz band. As noted above, the FCC in October 2018 proposed to allow unlicensed devices to share the entire 6 GHz band – 1200 MHz of spectrum – with incumbent licensees.²⁰ This is more spectrum than currently is used for Wi-Fi in total.²¹ (Keep in mind, too, that Wi-Fi 6 is able to utilize capacity more efficiently than prior versions of the technical specification.²²) Debate continues in the docket regarding the precise measures necessary to protect existing users from impermissible interference, including power limits,

¹⁸ See Wi-Fi Alliance, "Wi-Fi Alliance® brings Wi-Fi 6 into 6 GHz" (January 3, 2020), available at <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-brings-wi-fi-6-into-6-ghz> ("Wi-Fi Alliance® is introducing new terminology to distinguish forthcoming Wi-Fi 6 devices that are capable of 6 GHz operation.... Wi-Fi 6E brings a common industry name for Wi-Fi® users to identify devices that will offer the features and capabilities of Wi-Fi 6 – including higher performance, lower latency, and faster data rates – extended into the 6 GHz band.").

¹⁹ News Release, *FCC Seeks to Facilitate Shared Use in the 3.1-3.55 GHz Band*, WT Docket No. 19-348 (released December 16, 2019), available at <https://docs.fcc.gov/public/attachments/DOC-361340A1.pdf>. See also *Facilitating Shared Use in the 3.1-3.55 GHz Band*, Notice of Proposed Rulemaking, WT Docket No. 19-348, FCC 19-130 (released December 16, 2019), available at <https://docs.fcc.gov/public/attachments/FCC-19-130A1.pdf>.

²⁰ *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295; *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Proposed Rulemaking, FCC 18-147 (released October 24, 2018), available at https://ecfsapi.fcc.gov/file/1024814219781/FCC-18-147A1_Rcd.pdf.

²¹ See Peter Rysavy, "6GHz should be allocated for both licensed and unlicensed applications," *Light Reading* (March 19, 2020), available at <https://www.lightreading.com/5g/6ghz-should-be-allocated-for-both-licensed-and-unlicensed-applications/a/d-id/758324> (noting that "an additional 1.2GHz of midband spectrum for unlicensed use will almost double the amount of spectrum allocated to unlicensed compared with cellular, a complete unbalancing of spectrum priorities that doesn't begin to reflect the equal importance of each type of spectrum").

²² See Roslyn Layton, "How Much Spectrum Should Be Unlicensed?," *Forbes* (March 16, 2020), available at <https://www.forbes.com/sites/roslynlayton/2020/03/16/how-much-spectrum-should-be-unlicensed/#5992cc1cce93> (emphasizing that "Wi-Fi 6 promises a quantum level improved efficiency and could further change the optimal spectrum allocation").

restricting certain devices to indoor-only use, and Automatic Frequency Control (AFC). Nevertheless, and assuming those technical questions are resolved adequately, there appears to be widespread support for unlicensed sharing of the lower portion of the band.

However, given the urgent need to make additional mid-band spectrum available for 5G, some have argued that, before introducing – perhaps irreversibly – unlicensed devices into the upper portion of the 6 GHz band, the FCC first should explore fully the viability of auctioning that spectrum for flexible licensed use.

CTIA, for example, has urged the Commission to adopt a *Further Notice of Proposed Rulemaking* to investigate the possibility of licensing the 6.425-7.125 GHz band.²³ As it noted in a recent *ex parte*, "[t]he 6 GHz band offers the unique opportunity to enable new unlicensed and licensed services, and the Commission should not squander this chance to resolve the licensed mid-band spectrum deficit by giving away all 1,200 megahertz for unlicensed use prematurely."²⁴

Similarly, Richard Bennett of the High Tech Forum, a veteran network engineer who has made contributions to multiple Wi-Fi standards, has urged the FCC not to share the entire 6 GHz band with unlicensed devices at this time. Instead, he argues that the agency should conduct a pilot program using only 480 MHz in the lower portion of the 6 GHz band, enough spectrum to support three 160 MHz Wi-Fi 6 channels.²⁵ As Mr. Bennett points out, the widespread adoption of new Wi-Fi technology requires a critical mass of consumers to upgrade to compatible equipment (computers, tablets, smartphones, routers, access points, etc.) and often takes years. Consumers, therefore, would receive little incremental benefit from the shared use of the entire 6 GHz band in the short term and, "[i]f the Wi-Fi industry can roll out an upgrade that works efficiently over three contiguous 160 MHz channels and still needs more spectrum, that's a conversation we can have five years from now."²⁶

Without question, there may be thorny issues to resolve before the agency might move forward with an auction of the upper portion of the 6 GHz band.²⁷ That is the unfortunate reality of the

²³ See, e.g., Comments of CTIA, *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295; *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183 (submitted February 15, 2019), available at <https://api.ctia.org/wp-content/uploads/2019/02/190215-FINAL-CTIA-Comments-on-6-GHz-NPRM.pdf>, at 9-10 ("The Commission should promptly issue a further notice of proposed rulemaking to consider licensing the upper portion of the 6 GHz band for exclusive use, flexible rights services. With this new notice, the Commission can fully explore licensed use cases for the upper 6 GHz band and ensure that it allocates new uses in the band in the most optimal way to meet consumer demands.").

²⁴ Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183, and WT Docket No. 19-348 (submitted March 23, 2020), available at <https://ecfsapi.fcc.gov/file/10323336318764/200323%20AM%20Mid-Band%20Update%20Ex%20Parte.pdf>, at 2.

²⁵ See Richard Bennett, "Resolving the 6 GHz Conundrum," *High Tech Forum* (March 6, 2020), available at <https://hightechforum.org/resolving-the-6-ghz-conundrum/>.

²⁶ *Id.*

²⁷ See, e.g., Jon Reid, "Telecom Fights Tech Over FCC Plan to Open Airwaves to Wi-Fi," *Bloomberg Law* (March 10, 2020), available at <https://news.bloomberglaw.com/tech-and-telecom-law/telecom-fights-tech-over-fcc-plan-to-open-airwaves-to-wi-fi> ("CTIA ... proposes shifting incumbent users from their section of the 6 GHz band that would be auctioned off to carriers to the 7 GHz band. But that part of the spectrum is already designated for federal government use, and government agencies are hesitant to allow private sector users on their spectrum.").

spectrum crunch we face today, as then-NTIA Administrator David Redl observed well: "[i]f we're being honest, the era of easy spectrum decisions is over."²⁸

In addition, it is important to keep in mind that decisions to dedicate spectrum to unlicensed use are particularly difficult to undo. Richard Bennett recently explained why:

Assigning unlicensed spectrum is a much more consequential move than selling licenses because once a Wi-Fi device is certified no one is accountable for the problems it may cause in the field. The FCC can't come into your office and make you point your antennas in a different direction, it can only instruct vendors to issue software updates that turn off access to particular channels. And it almost never does that.²⁹

To summarize: more mid-band spectrum is needed for 5G. There is at least a possibility that the upper portion of the 6 GHz band could be made available for flexible licensed use. The FCC can act promptly to free sufficient spectrum in the 5.9 GHz and lower 6 GHz bands to establish four contiguous 160 MHz wideband channels for Wi-Fi 6 – and it should. It therefore would be prudent to take the time now to investigate fully the ability to clear and license the upper portion of the 6 GHz band. Consumers in the short term still would reap the full benefits of Wi-Fi 6. And the FCC would keep its options open.

Conclusion

U.S. global leadership in the deployment of 4G technology produced substantial economic gains. The reward for victory in the race to 5G is expected to be exponentially higher. It would be a major mistake to squander the initial gains that American mobile carriers have realized in 5G subscriptions by failing to make available the mid-band spectrum needed for future 5G deployments. The 3.5 GHz band and the C-band hold promise for adding 350 MHz by 2023, and the Commission should be commended for its actions in this regard. But more spectrum is required for the United States to remain competitive.

The FCC has proposed to share the entire 1200 MHz of spectrum in the 6 GHz with unlicensed devices, but it appears that Wi-Fi 6's need for additional spectrum (and for 160 MHz wideband channels) can be satisfied promptly – and without foreclosing the possibility of flexible licensed use of the upper portion of that band – by limiting sharing to the lower portion of that band at this time.

At the end of the day, it may be the case that licensed use of the upper portion of the 6 GHz band is not viable. Without question, there are challenging issues that must be resolved. However, moving forward with the proposal to allow unlicensed devices to share the entire 6 GHz band as a practical matter would foreclose that possibility. Given the critical importance of mid-band

²⁸ Remarks of David J. Redl, Assistant Secretary of Commerce for Communications and Information, at the SIA Leadership Dinner, Washington, DC (May 6, 2019), available at <https://www.ntia.doc.gov/spechtestimony/2019/remarks-assistant-secretary-redl-sia-leadership-dinner> (as prepared for delivery).

²⁹ Richard Bennett, "Resolving the 6 GHz Conundrum," *High Tech Forum* (March 6, 2020), available at <https://hightechforum.org/resolving-the-6-ghz-conundrum/> (citation omitted).

spectrum to our 5G future and the lack of significant downside to an incremental approach, the Commission instead should adopt a more modest, cautious strategy.

* Andrew Long is a Senior Fellow of the Free State Foundation, an independent, nonpartisan free market-oriented think tank located in Rockville, Maryland.