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Getting to "Yes" on Allocating Identified 5G Mid-Band Spectrum

by

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I. Introduction and Summary

The United States is at the forefront of 5G development, as I've indicated [here](#). 5G will require a mix of new low-, mid-, and high-band spectrum for terrestrial mobile broadband use. Although the U.S. is arguably leading the world in allocating and assigning high-band spectrum, allocating new mid-band spectrum should now be a primary objective. Some estimate that there is insufficient mid-band spectrum scheduled for near-term deployment to achieve ubiquitous, efficient 5G deployment. I submit that the FCC has identified a reasonable amount of mid-band spectrum for reallocation, but greater government effort must be devoted to actually allocating and assigning such spectrum. If the U.S. is to achieve world leadership in 5G, government must redouble its efforts to getting to "yes."

This FSF *Perspectives* is the first of two that discuss the mid-band spectrum issue. This one focuses on identified spectrum that is ripe for reallocation to terrestrial mobile broadband use. The second will focus on the government's flagging effort to identify further mid-band spectrum that today appears to be inefficiently used by government.

The Administration, Congress, and the FCC all recognize that there is a strong public interest in promoting secure, private-sector-driven 5G networks. 5G will require low-, mid-, and high-band spectrum. The U.S. is arguably the world leader in making additional high-band allocations, and

low-band assignments are progressing apace. New mid-band spectrum is the next order of business because its propagation characteristics permit greater building penetration and more extensive coverage in rural and suburban locations. Studies have demonstrated that additional mid-band allocations will spur investment, increase GDP, and add American jobs.

Several mid-band spectrum ranges have been identified for reallocation to 5G use, but actual allocation and assignment is lagging.

The first new mid-band spectrum capable of supporting 5G services is the 3.5 GHz band, which can produce up to 70 MHz of priority access spectrum, the most useful for commercial carriers. Now that the FCC has modified the Consumer Broadband Radio Service (CBRS) licensing rules to make the spectrum more useful for commercial carriers, such as increasing the license's geographic sizes and term lengths, at least some of the 3.5 GHz band can be placed in the 5G column. Commissioners Michael O'Rielly and Jessica Rosenworcel rightfully have urged that the 3.5 GHz auction be scheduled soon.

Last year, the FCC proposed to reallocate up to 500 MHz of the 3.7-4.2 GHz band, the C-Band used by satellite providers beaming video to cable TV and broadcasters, and to a declining number of fixed point-to-point services. The C-Band Alliance has proposed to conduct what it calls "secondary market transactions" to reallocate 200 MHz of the spectrum and move existing satellite providers to a smaller portion of the band. The C-Band Alliance proposal holds some promise for freeing up spectrum in a relatively brief period of time, and this is a positive. But opponents of the plan have suggested there are some problems with the proposal that should be addressed, such as the fairness of the process, a potential loss of revenues for U.S. taxpayers, and the adequacy of protection in the "repacking" process.

A greater allocation of the amount of spectrum, such as 300 MHz, could improve the likelihood that U.S. taxpayers might recover some revenues. Ultimately, it likely is not as important *what* approach is used to free up this mid-band spectrum for mobile use as *when* a plan is finalized for implementation. And, ultimately, it is not as important *what* label is attached to the plan, or how the elements of the plan are characterized, as *when* a plan can be adopted that is legally sound and practical from a policy perspective. It may well be that a reallocation plan ultimately will incorporate, in some fashion, elements of what are considered "secondary markets" and "incentive auction" approaches.

On May 9, the FCC adopted a notice proposing to reallocate the 1675-80 MHz band for shared use between private terrestrial wireless broadband users and federal operations, subject to protection of current users. The band is currently allocated to both federal and non-federal users of radiosonde and meteorological space-to-earth services. The FCC's May 9 action is a positive step in making more mid-band spectrum available for 5G applications. Indeed, in a statement issued regarding the Commission's notice, Commissioner Brendan Carr said this referencing adjacent L-band spectrum: "The 5 MHz before us is a small sliver of spectrum, to be sure. But if it's combined with adjacent and nearby channels, we could have a 40 MHz block that offers high-throughput at great distance. Those are excellent characteristics for next-gen mobile broadband."

In March 2018, the FCC proposed to open up 50 MHz of the 4.9 GHz band for shared use with public safety entities. The band is lightly used by currently eligible entities and it cries out for more efficient use. The Commission should bring this proceeding to a close.

Finally, because unlicensed devices will be complementary to 5G services, the FCC should act in these unlicensed proceedings as well. One proceeding that has been pending for six years proposes to reallocate for shared use 75 MHz in the 5.9 GHz band currently dedicated exclusively to transportation use. In the 20 years since allocation, the automotive industry has failed to develop services in the band. Commissioners O’Rielly and Rosenworcel have both urged that an NPRM be issued promptly regarding such reallocation. [As this *Perspectives* was going to press, in a welcome development, FCC Chairman Ajit Pai announced the commencement of a rulemaking to consider usage in the 5.9 GHz band.]

In addition, the FCC last year proposed to reallocate for shared use 6.9 GHz spectrum for unlicensed use, currently allocated to fixed satellite services, fixed services, broadcast auxiliary and cable TV relay services. The FCC should move quickly to bring these proceedings to a close so that important unlicensed uses can proceed in these bands.

Mid-band spectrum needs to be the next focused target of 5G spectrum allocations. Getting to "yes" on producing enough mid-band spectrum will enable the U.S. to achieve its goal of being the world leader in 5G innovation and deployment. This will ultimately redound to the benefit of the American economy and consumer. U.S. leadership will achieve the secure private-sector-driven 5G network that consumers and the world desire.

II. New 5G Mid-Band Spectrum Is Critical to Unleashing the Economic Power of 5G for American Consumers

5G will make mobile broadband faster, with greater capacity and lower latency. These characteristics will produce life-changing advances in numerous industries, including health care, education, vehicular automation, communications, and entertainment. Estimates of consumer welfare impacts vary, but the trajectories of these estimates are all in agreement that the consumer benefits will be enormous. These welfare impacts will surely increase if the U.S. industry leads the global 5G race through the ability to dictate standards, drive investment and innovation, and reap first-to-market economic benefits in GDP growth and employment.

Because of these tangible benefits, President Donald Trump [recognizes](#) the value of secure, private-sector-driven 5G networks. The Administration therefore has made supporting 5G network development a national priority. Congress also is on board through bipartisan enacted legislation like [RAY BAUM'S Act](#). The FCC’s [5G FAST Plan](#) is consistent with Administration and congressional policy, which aims to increase spectrum allocations, improve infrastructure development, and modernize regulations. FCC Commissioner Brendan Carr’s 5G “world tour” therefore represents a bipartisan recognition of the important contribution that private-industry-driven 5G will produce for the U.S. economy and American workers, and for meeting the seemingly insatiable American demand for broadband connectivity, anywhere, any time.

Private sector 5G development plans call for a variety of additional low-, mid-, and high-band spectrum in order to widely and efficiently deploy 5G. Of course, existing mobile spectrum may be used for delivery of 5G services over time, but existing spectrum is not sufficient by itself to meet surging consumer demand. The FCC is to be commended for recognizing the need for an allocation of new spectrum in all three bands.

To its credit, the FCC is in the process of reallocating new low-band spectrum achieved through the incentive auction to repurpose over-the-air TV broadcasting spectrum. The implementation of this spectrum reallocation appears to be meeting deadlines. Low-band spectrum exhibits greater building penetration, and its signal propagates over a relatively wide geographic area.

The FCC has been actively auctioning high-band spectrum, including in the 24, 37, 39 and 47 GHz bands. Commissioner Michael O’Rielly [has stated](#) the evidence shows that the U.S. has led the world in making high-band spectrum assignments for 5G. High-band spectrum has relatively greater broadband capacity and latency, but propagates over relatively shorter geographic areas.

Mid-band spectrum, between 1 and 6 GHz, has been the focus of a variety of international spectrum allocations. Mid-band spectrum is required for 5G because its propagation characteristics permit more extensive coverage in rural and suburban locations. Such coverage could not be achieved economically with high-band spectrum alone. Because mid-band spectrum has relatively better propagation characteristics than high-band, fewer tower locations are required, and costs are particularly lower during early deployment stages. Finally, certainty as to mid-band allocations will improve the availability of 5G equipment, leading to faster and less costly equipment. Commissioner O’Rielly has been very active in urging that mid-band allocations be completed fairly and promptly.

I have more thoroughly described [here](#) the economic benefits of adding more mid-band spectrum to the 5G mix. Recently, the Analysis Group [estimated](#) that, based on the assumption that 400 MHz of new 5G mid-band spectrum is deployed, approximately \$274 billion could be added to domestic GDP, with 1.3 million new jobs including direct and spillover effects. Based on historical deployment data, carriers can be expected to invest approximately \$154 billion over the seven years following the beginning of spectrum deployment.

III. The FCC Has Identified Several Possible 5G Mid-Band Allocations but Further Action Is Needed

A. 3.5 GHz

The first new mid-band spectrum capable of supporting 5G services is 3.55 to 3.7 GHz (3.5 GHz), known as the Consumer Broadband Radio Service (CBRS). Up to 70 MHz of the band is designated as priority access spectrum, which is the most useful for commercial carriers, with a total of 150 MHz for all users. Now that the FCC has [modified](#) the CBRS licensing rules to make the spectrum more useful for commercial carriers, such as increasing the license's geographic sizes and term lengths, at least some of the 3.5 GHz band can now be placed in the 5G column.

The CBRS Alliance recently announced adoption of environmental sensing capability (ESC) parameters that the FCC staff has approved. The FCC now needs to approve sharing administrators (SAs) to protect mostly government users of the band. Although Free State Foundation President Randolph May and I [have expressed](#) skepticism about the usability of this band for 5G in the past, the FCC, along with industry users, have made strides to fix the problems we identified with the band. For his part, Commissioner O’Rielly [is pleased](#) that the ESC standards have been agreed to, but he’s still concerned that the SA sharing parameters may not be finalized and that SA applications have not yet been granted by the FCC.

Problematically, it now appears that the auction will have to wait until some unspecified time in 2020. Both Commissioners O’Rielly and Rosenworcel rightfully have suggested that the FCC should have the ability to conduct more than one auction at a time. After all, simultaneous auctions are not impossible to envision. If it is a money issue, the Administration and Congress could resolve it by allocating sufficient resources to accomplish the task.

I recognize that conducting too many auctions too soon can lead to lower industry participation due to the practical limits on raising capital. But given industry statements that a more prompt mid-band allocation is necessary, such concerns do not seem to be an insurmountable problem here.

And there is no doubt that a substantial part of the blame for the slow deployment of the 3.5 GHz band is the previous FCC’s overly regulatory approach to the band. An overly complicated allocation scheme, a top-down government view of what users would contribute most to the “market,” and an overemphasis on sharing with governmental users, all combined unnecessarily to delay the allocation. The big question that still remains is whether the experimental sharing arrangement will work. In general, I’m not a fan of sharing because it technologically complicates the use of the spectrum, increases the risk of interference, and reduces the flexibility to meet customer demand. But as a practical matter, faster spectrum deployment is preferable to a seemingly endless stalemate. The auction needs to be scheduled and conducted post haste.

B. 3.7-4.2 GHz

Last year, the FCC [proposed](#) to reallocate up to 500 MHz of spectrum in the 3.7-4.2 GHz band, known as the C-Band. C-Band spectrum presently is largely used by Fixed Satellite Service (space-to-earth) (FSS) providers that offer video transmission services to cable TV and broadcasting customers, including the receive-only satellite dishes used to receive the satellite signals. The band also includes fixed services, such as common carrier point-to-point microwave and private operational fixed microwave links, a use which has been declining rapidly in recent years.

A group of the largest C-Band satellite companies, the C-Band Alliance, proposed to free up 200 MHz of spectrum (with a 20 MHz guard band). The C-Band Alliance proposes to do this through private secondary market transactions and by moving existing satellite users to a smaller portion of the band. The Alliance represents that it can place the vacated spectrum in mobile broadband provider hands within 18 to 36 months of gaining the FCC’s approval. Comments have now been

received, and *ex parte* filings at the Commission reveal continued opposition to the C-Band Alliance plan.

The C-Band Alliance proposal holds some promise for freeing up spectrum in a relatively brief period of time, but opponents to the plan have raised some legitimate concerns with the proposal. In my view, more mid-band spectrum available for terrestrial mobile broadband is better than less spectrum. Commissioner O’Rielly [conceded](#) that he does not believe the original 500 MHz proposal is realistic, but he has strongly counseled the various parties, in any plan, to strive for reaching at least 300 MHz. Commissioner Carr has more recently [urged, at least in urban areas](#), that more than 200 MHz should be harvested from the C-Band. The C-Band Alliance is pushing back that 300 MHz is not technologically feasible using today’s technology, which then begs the question about how quickly such technology can be changed and at what cost.

The C-Band Alliance has been slow to provide more robust details of its planned "secondary market transaction" procedures, which it promised to reveal months ago. Some opponents have questioned the fairness of the secondary market transactions. Other existing users raise concerns that they are not part of the Alliance and could be harmed by the “repacking” consequences of implementing the proposal. Commission staff has for its part recognized there are still outstanding questions, so last week it [asked](#) for further focused comments in the proceeding.

More complete C-Band Alliance plan details should be made public very soon. Although secondary market transactions have been permissible for years, there have been none completed on the scale and with the potential impact of the Alliance proposal. Fairness to all parties should be assured. This includes both the opportunity to participate and to be treated fairly during the “repacking” process that will move existing users to the smaller portion of the band reserved for FSS. One of the benefits of a larger spectrum reallocation is that increased available spectrum can produce higher revenues which, at least in part, could be made available to the taxpayers. And a plan that involves some form of secondary market transactions has the benefit of likely leading to a speedier repurposing of the subject spectrum than a traditional auction.

In the end, the FCC will have to resolve these issues. Whatever procedures the agency decides to use, it is critical that the issues be resolved as expeditiously as possible with fair consideration given to existing users, their customers, and to the intended recipients of the repurposed spectrum, mobile broadband providers and their customers. Ultimately, it likely is not as important *what* approach is used to free up this mid-band spectrum for mobile use as *when* a plan is finalized for implementation. And, ultimately, it is not as important *what* label is attached to the plan, or how the elements of the plan are characterized, as *when* a plan can be adopted that is legally sound and practical from a policy perspective. It may well be that a reallocation plan ultimately will incorporate, in some fashion, elements of the "secondary markets" and "incentive auction" approaches.

C. 1675-1680 MHz

At the May 9 meeting, the FCC initiated a [proceeding](#) proposing to allow terrestrial broadband use of the 1675-1680 MHz band, subject to protection of current users. The band currently is allocated to both federal and non-federal users of radiosonde and meteorological space-to-earth

services. The federal government repeatedly has proposed to reallocate the spectrum for shared use with federal weather satellites. Some services are scheduled to be moved to other spectrum, but the timing of such a move is still uncertain. There continue to be non-federal weather-related earth station users that raise interference concerns, but these issues are slated to be addressed in the proceeding. The FCC's initiation of the rulemaking proceeding is positive.

Although the 1675-1680 band is a relatively small swath of spectrum, it is one more piece of the puzzle of locating usable blocks of mid-band spectrum for 5G. Indeed, in a statement issued regarding the Commission's notice, Commissioner Carr said this referencing adjacent L-band spectrum: "The 5 MHz before us is a small sliver of spectrum, to be sure. But if it's combined with adjacent and nearby channels, we could have a 40 MHz block that offers high-throughput at great distance. Those are excellent characteristics for next-gen mobile broadband."

I'll have more to say about sharing with government users in a later FSF *Perspectives*.

D. 4.9 GHz.

In March 2018, the FCC [proposed](#) to open up 50 MHz of the 4.9 GHz band for shared use with public safety entities. The band is lightly used by currently eligible entities and it cries out for more efficient use.

Local government and emergency responders claim that they need the spectrum, but only about 3.5 percent of eligible entities use the spectrum, mostly in limited geographic areas. They argue that their inability to obtain usable equipment prevents filling the band. Little has been said by the FCC concerning its current plans to bring this proceeding to a conclusion. The FCC should refocus its original interest in addressing this lightly used spectrum by permitting sharing by commercial carriers and public interest entities as proposed in last year's NPRM.

IV. The Commission Should Address Pending Unlicensed Spectrum Allocation Proceedings

Although technically not part of 5G networks, unlicensed devices will be complementary to 5G deployment efforts and thus also should receive attention by regulators. Unlicensed spectrum can be used for a variety of services, including support of "Internet of Things" devices and greater broadband usage.

For about six years the FCC has proposed to open up 75 MHz of spectrum in the 5.9 GHz band for shared use. The band is currently allocated exclusively to dedicated short-range communications (DSRC) by automotive and public sector transportation uses. The FCC [asked](#) that the record be refreshed in 2016, but an NPRM has not yet been issued to implement the idea. When the DSRC band originally was allocated, the FCC was told that the automotive industry was interested in the spectrum to improve vehicular safety and growing autonomous vehicular development. The band is also available for other transportation-related uses but it is unclear as to the extent of the scope of such permitted use. But the automotive industry has failed to develop devices and applications for the band in the 20 years since allocation. The time has come to move forward with a reallocation that could allow this band to be shared with unlicensed

national information infrastructure (U-NII) devices that provide Wi-Fi, cordless telephones, and fixed outdoor broadband transceivers used by wireless Internet providers.

The FCC has been less than transparent about progress and timing for quickly resolving proceeding issues. The Department of Transportation, which has been a vocal cheerleader for transportation use of DSRC spectrum, apparently never has been a vocal supporter of the sharing proposal. Now, some private automotive interests have expressed belated interest in the band, and Toyota has announced that it is putting expected 2023 deployment on hold because of the uncertainty as to an FCC allocation decision.

The FCC has been planning to conduct interference tests for shared U-NII use in the DSRC band. But the FCC has only [released](#) one study regarding potential interference resulting from sharing the band. Commissioners O’Rielly and Rosenworcel both have urged that an NPRM proposing reallocation should be issued without delay. Regardless of the cause, the delay looks like it is unnecessary. [As this *Perspectives* was going to press, in a welcome development, FCC Chairman Ajit Pai announced the commencement of a rulemaking to consider usage in the 5.9 GHz band.]

The FCC has also [proposed](#) opening up a portion of the 5.9-7.125 GHz (6 GHz) band for unlicensed use that would be capable of supporting Wi-Fi and other U-NII devices. The 6 GHz band is currently occupied by FSS, point-to-point microwave, broadcast auxiliary, and cable television relay services. Again, this proposal appears to hold some promise for additional spectrum allocation to address consumer wireless demand that is complementary to 5G, but there is scant news on possible timing for a final report in that docket. The proposal was laudable, and it should be addressed as soon as possible.

V. CONCLUSION

Mid-band spectrum needs to be the next focused target of 5G spectrum allocations. Getting to "yes" on producing enough mid-band spectrum will enable the U.S. to achieve its goal of being the world leader in 5G innovation and deployment, which will ultimately redound to the benefit of the American economy and consumer. U.S. leadership will achieve the secure private-sector-driven 5G network that consumers and the world desire.

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Further Reading

Gregory J. Vogt, "[The Race for Global 5G Leadership: Where Are We Now?](#)" *Perspectives from FSF Scholars*, Vol. 14, No. 7 (March 5, 2019).

Gregory J. Vogt, "[STREAMLINE 5G Processes to Match the Speed of Business](#)," *FSF Blog*, (July 9, 2018).

Gregory J. Vogt, "[RAY BAUM Would be Proud](#)," *FSF Blog* (March 23, 2018).

Gregory J. Vogt, "[Now Is the Time for MOBILE NOW](#)," *Perspectives from FSF Scholars*, Vol. 12, No. 15, (April 28, 2017).

Randolph J. May & Gregory J. Vogt, "[Focusing on Communications Infrastructure Development: Completing the Incomplete Obama Administration Spectrum Report Card](#)," *Perspectives from FSF Scholars*, Vol. 11, No. 44 (December 13, 2016).