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Industry Voices—Rysavy: Untangling C-band for a new broadband future

by *Peter Rysavy* | Jan 18, 2019

5G in mid-band needs sufficient capacity in order to truly complement operation in low and high bands. (Pixabay)

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C-band spectrum has vaulted into the position of what may be the highest priority for the FCC, putting at stake the future success of mobile broadband in the United States. December 2018 was the deadline for comments on the FCC's **Notice of Proposed Rulemaking** on 3.7 GHz to 4.2 GHz, a massive swath of spectrum that the FCC is planning to repurpose. The hundreds of **replies from communications, computing,**

and internet companies demonstrate how important this spectrum is—both for incumbents as well as those who wish to use the spectrum for mobile broadband.

The comments provide many different views on how to prioritize this spectrum and how to move forward with licensing the spectrum for new usage, especially 5G. This spectrum is currently used for fixed satellite services that include backhaul for mobile networks in disaster recovery and as the predominant method of video content distribution. This band, however, has also become the global sweet spot for 5G, providing a compelling blend of capacity, performance, and relative ease of deployment compared to mmWave due to better signal propagation.

The solution that will provide the greatest benefit to the wireless industry is to allocate at least 300 MHz of this spectrum for 5G; only then can the full potential of 5G be realized. 5G was designed from the ground up to thrive on larger radio channels. Whereas 4G LTE radio channels are limited to 20 MHz and require carrier aggregation for larger bandwidths, 5G radio channels can be as large as 400 MHz. When combined with carrier aggregation, 5G will enable multi-GHz radio channels.

My 2018 **broadband network model** calculates that with 100 MHz of C-band spectrum, an operator can achieve capacities that range from 2 Gbps/sq. km. to 160 Gbps/sq. km. depending on number of sites and other factors, including maturity of technology. For example, in currently specified versions of 5G, 100 MHz deployed with 15 sites per sq. km results in a capacity of 20 Gbps/sq. km., enough to offer a viable broadband alternative to wireline in suburban areas. In comparison, a typical DOCSIS network with four segments has 26 Gbps/sq. km. of capacity.

Any less than 100 MHz per operator puts the operational value of the spectrum into question. Operators already have capacity in sub 3-GHz bands, especially now with the ability to harness unlicensed spectrum at 5 GHz using Licensed Assisted Access (LAA). Meanwhile, operators are moving forward aggressively with mmWave deployments. With these, they can achieve tremendous capacity and performance, but only with **dense deployments**.

5G in mid-band needs sufficient capacity in order to truly complement operation in low and high bands. Mid-band deployment will work in tandem with 5G in mmWave and a combination of LTE and 5G in lower bands, as I explained in August in my article titled "**Midband spectrum for 5G is needed now**." 5G's dual connectivity capability will provide constant connectivity in lower bands while simultaneously leveraging the capabilities of higher bands. The approximate 300 MHz of spectrum in C-band will fulfill the ideal three-band solution for 5G.

Others have reached similar conclusions regarding C-band. For example, **CTIA** calls for hundreds of MHz of spectrum, **Nokia** for 250-300 MHz, the **Competitive Carriers Association** for 320 MHz and **T-Mobile** for 300 MHz in **most markets**.

The satellite industry, represented by the C-Band Alliance, has offered 200 MHz. This amount is insufficient in my view, not only undermining 5G potential, but putting the United States at a severe global competitive disadvantage. A global spectrum **report by Analysys Mason** performed for CTIA concludes that by the end of 2020, benchmark countries will average nearly 300 MHz of mid-band spectrum per country. China, with aspirations of becoming the global leader in 5G, is planning on licensing 500 MHz, using 3.3-3.6 GHz and 4.8-5.0 GHz. The satellite industry, while still needing spectrum in this band, has options such as operating in higher bands (Ku and Ka) and moving connections to fiber. The wireless industry has no such options.

Being first to broadly deploy this new generation of cellular technology not only allows the wireless industry to deliver effective 5G service, but also facilitates how other industries that use wireless connectivity improve their efficiency and support new use cases. 4G supremacy was a major factor in enabling the U.S. to dominate mobile computing. Moving forward, 5G will be synergistic with new industries such as AI, autonomous driving, utilities, smart cities, drones, VR, AR, improved healthcare, and optimized manufacturing.

Mid-band spectrum is also ideal for rural broadband, as I discussed in my article "**How 5G will solve rural broadband**." Contrary to using 5G technology, some groups are advocating a fixed, point-to-multipoint (P2MP) architecture for accessing portions of C-band spectrum, perhaps coordinated by databases to allow co-existence with satellite services. This approach, however, would complicate an already difficult transition for the band. In a 5G world, fixed connectivity is a subset of mobile connectivity, and the industry will achieve greatest efficiency and expediency using a common licensing and technology approach for both fixed and mobile, as will be possible with flexible-use licenses.

The FCC is giving this band rightful priority, but the FCC faces tremendous pressure given that the United States currently lags other countries by at least a year, if not longer. The consequences of decisions made regarding this band will be enormous. The need for rapid and appropriate action is paramount.

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