6 GHz should be allocated for both licensed and unlicensed applications

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3/19/2020

Published at: https://www.lightreading.com/5g/6ghz-should-be-allocated-for-both-licensed-and-unlicensed-applications/a/d-id/758324?

Unlicensed spectrum for Wi-Fi and licensed spectrum for cellular networks play equally critical roles, with Wi-Fi sometimes the preferred connection, and at other times, cellular. Until now, the FCC has allocated comparable amounts of spectrum for each, but with the current Notice of Proposed Rulemaking (NPRM) for 6 GHz, the FCC is contemplating a huge additional 1.2 GHz allocation for unlicensed spectrum only.

With 5G technology coming to market and promising to unleash a new wave of innovation, allocating so much sweet-spot spectrum for unlicensed could be a strategic mistake. It could leave US networks stranded with insufficient midband spectrum at a time when other countries are allocating far more for 5G.

The numbers are straightforward: In the US, sub-3 GHz licensed bands, including original cellular, Personal Communications Service, Advanced Wireless Service and Broadband Radio Service, along with a few additional bands, add up to 739 MHz of spectrum. Citizen Band Radio Service (CBRS) at 3.5 GHz will add up to 70 MHz of licensed bands in an auction this year, and in an additional auction planned for the end of this year, C-Band spectrum (3.7 to 4.2 GHz) will provide 280 MHz for 5G. This adds up to about 1.1 GHz for licensed operation.

In comparison, Wi-Fi bands include about 100 MHz of Industrial Scientific and Medical (ISM) bands for operation at 900 MHz and 2.4 GHz, Unlicensed National Information Infrastructure (U-NII) bands totaling 580 MHz, and CBRS in General Authorized Access (GAA) mode supplying between 80 MHz and 150 MHz, depending on the number of licensed channels. That adds up to 760 MHz to 830 MHz, a little less than the cellular licensed bands, but in balance.

In mmWave bands, however, the total spectrum licensed in 24, 28, 37, 39, and 47 GHz bands is 4.95 GHz, just about one-third of the 14 GHz of unlicensed spectrum at 60 GHz. In total then, including mmWave, unlicensed already has far more spectrum than licensed.

But what matters more in the near term is midband spectrum, 3 to 10 GHz.

From a pure numbers perspective, an additional 1.2 GHz 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.

And the numeric discrepancy is magnified by the fact that any new deployment at 2.5 GHz and higher will employ massive MIMO (Multiple-Input Multiple-Output) antennas, resulting in a 3X capacity gain according to CommScope.

This is why deploying 5G in the 280 MHz of C-Band spectrum will deliver explosive growth. A 3x performance multiplier makes the 280 MHz of C-Band spectrum equivalent in power to all of the spectrum available today in sub-2 GHz bands, with which massive MIMO is not currently used except in isolated instances. The problem, though, is that after C-Band, no immediate good opportunities exist for additional midband spectrum for 5G.

Except 6 GHz.

Midband spectrum is currently the sweet spot for 5G deployment. It provides a huge boost in capacity and performance thanks to massive MIMO, as well as other 5G efficiency gains, without requiring the density of mmWave small cells. In dense urban areas, current basestation densities will support rapid deployment of 5G using midband frequencies. The lower frequencies at midband relative to mmWave also provide better in-building penetration. Given that massive MIMO is not as effective in sub-2 GHz frequencies, midband spectrum is crucial for the success of 5G, explaining why other countries are moving as quickly as possible to expand midband spectrum allocations. As CTIA states in a recent letter to Congressional committees, South Korea is planning for 600 MHz of midband spectrum, Japan 1,000 MHz, and China already has 460 MHz.

Longer term, mmWave networks, deployed in hundreds of thousands of small cells, outdoors and indoors, will augment capacity an additional tenfold, but getting there will take most of the 2020s. 5G will also be able to use unlicensed bands, but only by sharing with other users in the band, making this a poor substitute for managed networks using licensed spectrum.

Even though the NPRM for the 1.2 GHz of unlicensed spectrum at 6 GHz came out in October 2018, and many hundreds of comments have already been filed, time has not run out to rethink the big picture for US spectrum strategy. Some may think that 280 MHz of spectrum for 5G in C-Band will be sufficient. That might be correct – if the US is

willing to lag behind other countries in 5G. The US led the world in LTE deployments during the 2010s, and that powered a mobile computing revolution. Similarly, countries that lead in 5G network performance will reap the rewards of a next-generation communications platform that, in combination with advances in technologies including AI and wearable computing, will drive new economic miracles.

Now is the time to reconsider 6 GHz and recognize the benefits of splitting it into both unlicensed and unlicensed allocations.

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