Momentum Growing for Gigabit Wireless Access and Backhaul Using V Band and E Band Spectrum

The FCC's support for mmWave wireless systems in the Rural Digital Opportunity Fund gives rural operators another option to extend broadband services to more customers.

By David Sumi / *Siklu*

Two recent moves by the FCC and similar actions outside the United States show growing support for the increased usage of the large amounts of bandwidth with low interference found in the E band. First, as part of the FCC's Rural Digital Opportunity Fund (RDOF) process to expand gigabit-speed services in rural areas, the FCC reversed previous language that would have prevented bidders from proposing millimeter wave (mmWave) systems to participate in the gigabit tier of service.

The FCC has now effectively set the requirements for these services in terms of capacity and latency – and allows the service providers and network equipment vendor communities to explore all options for ways to meet these requirements. Mixed fiber and mmWave deployments are one such option. This decision is in line with current technology trends because low-cost, high-capacity fixed wireless is growing rapidly. Fixed 5G in the 60 GHz (V band) and the 70/80 GHz (E band) offers performance similar to, if not faster than, mobile mmWave 5G.

As seen in initiatives such as Facebook's Terragraph project, multigigabit wireless connectivity for urban, suburban and rural areas is now a reality.

FIXED GIGABIT WIRELESS ACCESS EMERGES

Operating in the mmWave bands of 60 GHz and higher, fixed wireless solutions are used by leading service providers and system integrators to provide fixed 5G gigabit wireless access (GWA) services. They are ideal for smart-city projects requiring extra capacity for video security, Wi-Fi backhaul, and municipal network connectivity over one network.

It's also part of a long-standing trend in which many wireless internet service provider networks deploy both fiber and fixed wireless as a harmonious blend of best-in-breed technologies. For instance, fiber is deployed to bring a big pipe to an area, and fixed wireless branches off the pipe to cover the last mile to customer homes. All this wireless infrastructure operates at gigabit speeds.

Between the time the CAF II auction was held in 2018 and today, gigabit wireless solutions have exploded in the market. As for the industry, thousands of last-mile, GWA connections have been deployed in smaller cities and rural areas across the United States in the last three years. This year, another wave of 60 GHz products and services based on them will emerge; the latest chipsets enabling low-cost systems hit the market in mid-2019, and product releases are trending toward the third quarter of 2020.

NEW E BAND POSSIBILITIES

With regard to the E band component of the mmWave spectrum, the FCC decided unanimously to pursue changes in the use of the 70/80/90 GHz bands, as detailed in its announcement on June 9, 2020. The proposed changes would increase use of the E band for 5G backhaul connections and other services.

As the FCC notes, the E band currently is used for fixed, point-to-point communication and has been largely underutilized in vast areas of the United States. Further, a presentation submitted to the FCC aligns with the industry's long-standing advocacy of using mmWave to complement fiber infrastructure. Specifically, the vast densification needed for high-band 5G mmWave networks requires reliable backhaul in addition to fiber, particularly when 5G small cells are mounted on street-level structures such as light poles.

To meet the needs of 5G backhaul, the 71–76 and 81–86 GHz bands offer 10GHz of bandwidth. Carriers will need it considering that a typical macro long-term evolution (LTE) base station serving 2,000 subscribers today requires 1 Gbps or more of backhaul capacity. For a rough comparison, consider that a typical 4G base station requires as much as 100 times the backhaul capacity as its 3G predecessor. Further, because of lower latency and increased bandwidth requirements, 5G base stations will be built in much denser topography, especially in urban and suburban areas (e.g., many more small cells indoors and outdoors).

Mobile network operators (MNOs) therefore will require more backhaul capacity per link, and the number of links will grow significantly. Fiber optic lines offer essentially unlimited capacity, but they are not everywhere. Deploying a new fiber optic line is a rather expensive (the GSMA estimates roughly $70,000 per kilometer) and time-consuming process because it can take months. In addition, deploying fiber in certain areas, such as historic districts, is just not possible. As noted above, this is yet another example of how fiber optic and mmWave systems can complement each other perfectly to get the job done.

Regulators outside the United States also are beginning to open up the E band, and one MNO based in the Middle East provides a useful example of the possibilities in doing so. It currently has more than 2 million LTE subscribers, and most, if not all, will move to the next-generation radio access network (RAN) over the next few years. To complement its fiber-based backhaul, this operator has an extensive system of point-to-point microwave links (18, 23 and 38GHz) to connect its cell sites – for a total of 500 microwave links.

As this MNO's RAN added capacity with the introduction of LTE and the next-gen RAN, the microwave links began running out of the capacity needed to connect the cell sites. The range was good with traditional microwave, but capacities topped out at 400 Mbps and could be achieved only with advanced modulation technologies. The MNO decided to migrate all microwave links of 5 kilometers or less to E band mmWave radios. Initial capacities are set at 1 Gbps to support LTE and can expand to multigigabit as needed.

Upgrading these connections not only provides a much-needed capacity boost but also is more economical from both capex and opex perspectives. License fees for E band deployments are significantly lower than those for microwave, so the company saves money with every microwave link it replaces.

A non-MNO example of expanded E band usage comes from the southeastern United States, where a major internet and telephony service provider uses E band radios to deliver a multigigabit connection to an office park complex from a fiber POP more than 9 miles away.

As the market's insatiable demand for more bits in more places continues, the ability to deliver means using best-in-breed technology regardless of whether it's wireline or wireless. The V and E bands offer tremendous amounts of spectrum to deliver these gigabits, and governments around the world are waking up to the possibilities. Going forward, as 5G becomes widespread and trends such as work from home continue or become permanent, these fixed 5G mmWave systems will address residential broadband requirements and ensure a cohesive mobile broadband experience. ❖

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