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## 47 GHz — Out There on the Edge

*“I am often reminded that our community’s ability to defend its valuable spectrum depends so much on how, and how often, we utilize the spectrum we have been granted. Recall that Amateur Radio was initially created out of the short wavelengths that commercial wireless users discarded in our direction because they failed to see their commercial value. Look at what we were able to achieve with them through repurposing, improving, and pioneering. Ironically, today many of those higher frequencies serve the same vital communications purposes formerly served by much longer waves.”*

Recently, I asked ARRL’s Chief Technology Officer Brennan Price, N4QX, to think about our exclusive spectrum in the millimeter wave bands — the outliers for so many of us — and analyze why these frequencies might become vulnerable in the not too distant future. To those of you unfamiliar with our Washington, DC-based CTO, he spends a great deal of his effort manning the global defense of amateur spectrum at the International Telecommunication Union and coordinating this defense with sister societies in the International Amateur Radio Union. Our discussion turned to digital issues of bandwidth and throughput, and inevitably the topic of 47 GHz arose. So why, exactly, is 47 GHz so important to us, and why is it worthy of rigorous attention?

Brennan replied, “Modern communication needs demand ever-increasing throughput capacity. Wireless systems achieve increased capacity both through advances in data rate and increases in used bandwidth. Because it is easier to find a channel of, say, 200 MHz in the millimeter waves than it is at, for example, UHF, there has been intense research focusing on exploiting spectrum above 24.25 GHz for a variety of uses, including next-generation wireless broadband applications, commonly termed ‘5G.’”

Brennan went on to say that one of the leading researchers and advocates for exploiting the millimeter waves for broadband is, perhaps unsurprisingly, an accomplished and active radio amateur. Ted Rappaport, N9NB, in his professional capacity as Founding Director of NYU Wireless at New York University’s Tandon School of Engineering, has demonstrated that millimeter waves may be used for next-generation broadband communication systems on scales not previously thought possible.

“For a long time, millimeter waves were thought to be most suitable for the point-to-point work that radio amateurs perfected and continue to advance,” Brennan explained. “Ted’s work indicates that point-to-multipoint systems are feasible at this range, and the world has taken notice.”

The irony here is that successful experimentation by a radio amateur has drawn attention to amateur frequencies with potential commercial value that never might have occurred to us 20 years ago. But the apparent unintended consequences of N9NB’s success are not reasons to slow our research and on-air experimentation and enjoyment for fear of attracting unwanted attention, as some have suggested. To the contrary, it argues to

speed up experimentation, to demonstrate repeatedly and conclusively the vital contribution of the Amateur Radio community in pushing forward the frontier, to show that spectrum should be preserved for continuing productive amateur experimentation. After all, how would the nation benefit from the sale of National Park Service land for commercial development?

Brennan reminded me of one more recent advance on the 47 GHz band, also achieved by amateurs, early this summer: “On June 30, Mike Seguin, N1JEZ, and Harry Ingwersen, KT1J, set a new US-Canada DX record on the band, completing a 215-kilometer circuit from Whiteface Mountain in New York with Rene Barbeau, VE2UG, and Ray Perrin, VE3FN, on Mont-Tremblant in Quebec. These traditional point-to-point activities are valuable [and] rewarding... But they are not the only activities we can do on this band... The 47 GHz band is allocated to the Amateur Service and the Amateur-Satellite Service *on a worldwide primary and exclusive basis* [emphasis added]. We don’t have to work around others on this space. Perhaps the next generation of Amateur Radio broadband should consider — and develop upon — Ted Rappaport’s work.”

I am grateful to Brennan and his ARRL colleague Jon Siverling, WB3ERA, for their efforts on behalf of Amateur Radio. He notes that “as the ARRL Board of Directors was gathering in Newington for committee meetings on July 14, the FCC made 10.85 GHz of spectrum available for 5G wireless broadband above 24.25 GHz: 3.85 GHz on a licensed basis, and 7 GHz on an unlicensed basis. The FCC further proposed to make several bands on the WRC-19 agenda available for 5G. The 47 GHz band was not among them.” This FCC action is a major win for Amateur Radio. Let’s not squander the lead. I am persuaded by Brennan’s overarching implication that our best defense of spectrum has at its core vigorous and wide-ranging experimentation, including experimentation in realms where we might not feel entirely comfortable. Ted Rappaport and the hams who set the 47 GHz US-Canada distance record are out there on the leading edge of our spectrum allocation and Amateur Radio technology. I challenge to you meet them there.