Ericsson Microwave Outlook

October 2020
Spectrum is a finite and very valuable resource, which is why its efficient use is regularly reviewed by regulators. At the World Radiocommunication Conference 2019 (WRC-19), a global IMT (5G) identification was decided for the high bands: 26GHz (24.25–27.5GHz), 40GHz (37–43.5GHz) and 66–71GHz. As a result, usage of backhaul will eventually be transitioned from some of these bands, such as 26GHz in Europe. The timing of the transition will vary between countries, depending on the demand for 5G NR balanced against the importance of existing backhaul. The 32GHz (31.8–33.4GHz) and 80GHz (71–76 paired with 86GHz) bands were not identified for 5G and remain essential for backhaul.

At the conference, an agenda was also decided for the next WRC in 2023, which will consider IMT (5G) identification of mid-band spectrum. With its combination of coverage and capacity, additional contiguous mid-band spectrum is crucial in supporting 5G. One of the candidate bands is 6.425–7.125GHz, also known as upper 6GHz, which is today commonly used for backhauling; see Figure 3.

There is another use considered for the 6GHz backhaul band. The possibility to expand license-exempt wireless access into the band, without causing harmful interference with the licensed backhaul use, has been studied in the US and Europe. Some administrations see this as an important opportunity to enhance wireless broadband, utilizing Wi-Fi 6E, 5G NR Unlicensed (NR-U) and other unlicensed technologies.

The US has decided\(^1\) to allow unlicensed use in the 5.925–7.125GHz range, of which 5.925–6.425GHz and 6.525–6.875GHz are heavily used for backhauling; see Figure 4. Unlike many other countries, the 7/8GHz (7.125–8.5GHz) backhaul band is in the US reserved for federal use. In Europe, there is an ongoing review to allow unlicensed use\(^2\) in the 5.925–6.425GHz range, also known as lower 6GHz. The 6GHz and 7/8GHz bands are commonly used for backhauling in Europe, but the relative use differs from country to country.

The bands below 18GHz are essential for long-range backhaul due to their superior propagation characteristics.

Introducing unlicensed use in a licensed backhaul band raises many concerns. Regulatory studies assess the probability of interference using statistical simulations, complemented with the analysis of realistic critical scenarios.

New technical and operational rules should strike a delicate balance between new unlicensed use and maintaining reliable licensed backhaul. Administrations may have different levels of concern on the balance, depending on how common and strategically important the backhaul use is in a country.

There are some differences between the unlicensed rules in the US and Europe; see Figure 5. The draft European decision also includes a Country Determination Capability (CDC) to address the need for additional protection measures in some countries. Three different unlicensed device categories are discussed: Standard Power (SP), Low Power Indoor (LPI) and Very Low Power (VLP). There are also requirements for client devices. The allowed Equivalent Isotropic Radiated Power (EIRP) is limited for each unlicensed device category to protect the backhaul.

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**Figure 3: New usage considered for the 6GHz microwave backhaul band**

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<th>Frequency (GHz)</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
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Source: Ericsson (2020)

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\(^1\) Report and Order, FCC 20–51
\(^2\) Draft ECC Decision (28)01
A new geolocation concept is introduced in the US for SP devices – the Automated Frequency Coordination (AFC) system. The AFC receives the geographic location and operating parameters of the licensed backhaul from a database. It also requires the geographic coordinates and height above ground of each unlicensed device. The AFC then uses specified propagation models and backhaul interference protection criteria to determine which frequencies and power levels are available for use. The introduction of a geolocation database concept is also part of the proposed rules in Europe for LPI devices, as the second stage of implementation. Interference from unlicensed use can cause reduced throughput and, in the worst case, complete outage of a licensed microwave backhaul link. Microwave Analytics tools\(^3\) can be used to indicate interference as the root cause of a link problem. But the time it takes to find the interference source and resolve the issue is essential. There are concerns that this could take days or even weeks. In theory, the AFC is a promising approach to avoid interference, but its accuracy and reliability should be proven before being relied on in the field. A cautious and conservative approach is recommended, as licensed backhaul is ultra-reliable and provides critical services.

*Some European countries have decided that additional protection measures are needed to allow LPI devices at a second stage. These countries will investigate how to enable geographic restrictions managed through national geolocation databases.

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\(^3\) https://www.ericsson.com/en/portfolio/networks/ericsson-radio-system/mobile-transport/microwave/microwave-analytics/-advanced-microwave-insights-
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