Ericsson Response to 'Call for Input: Review of the use of fixed wireless links and spectrum implications'

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Ericsson welcomes the opportunity to respond to the Ofcom consultation 'Call for Input: Review of the use of fixed wireless links and spectrum implications, October 2023'. Response is due on 17 January 2024.

Summary:

Microwave solutions offer high capacity, low latency, low power consumption, and cost efficient transport and are excellent 5G transport solutions. High frequency bands like E-band, carrier aggregation, multi-band booster, and MIMO support the rapidly increasing capacity demand.

As capacity demands increase with 5G expanding in dense urban, suburban, and rural areas, higher backhaul capacities are needed within the traditional microwave frequencies 6-42 GHz. Microwave offers a perfect solution when fibre is too costly or too slow to implement.

Microwave solutions can increase capacities to existing sites and build high-capacity solutions for new sites. Capacities up to 10 Gbps over a single microwave hop are available, and up to 20Gbps when combining two microwave radios in the same hop.

Different 5G sites have different requirements and need different kinds of solutions. When expanding a 4G site to include 5G low band (0.6-2.6GHz FDD), the site's backhaul capacity can increase up to 1Gbps. When expanding to the 5G mid band (2.3-6GHz TDD), higher capacities are reached in RAN, and correspondingly high backhaul capacities are required - depending on the site this can be up to 10Gbps. When adding the 5G high band (24-42GHz TDD) in the future up to 20Gbps backhaul capacity may be necessary.

Densification of radio sites as well as new radio interfaces drive the need for higher port density and higher capacity in microwave nodes to handle the new connections. The increased radio capacity in 5G along with the coordination functions will require high-capacity interfaces.

Microwave long haul systems utilise the frequency range of 5 to 13 GHz, with a focus on maximizing spectral efficiency to get the most out of the available frequency spectrum. Typical use cases for long haul microwave are backbone networks in remote or rural areas, fibre redundancy, and providing connectivity where fibre is difficult or too costly, like over water with tidal ranges or across a deep valley. Long haul systems can use many channels over a hop enabling capacities up to 10 Gbps per hop, and over very long distances, up to 200 km.

Ofcom's Call for Input Questions and Ericsson Responses

Question 1:
Please provide a description of your current use of fixed links (or indicate which of the use types in Table 3.1 best describe your use type).
As a supplier of microwave equipment to the UK market, we see microwave providing a solution for many of the User Types defined in Table 3.1.

While the highest number of licensed fixed links are with Mobile Network Operators, we comment that microwave systems can provide reliable high-capacity services where fibre is not available - from the lower frequency bands such as L6 over longer distances to the more recent higher frequency E-Band services in 70/80 GHz.

Question 2:
What are the factors driving your choice of fixed links over alternative connectivity solutions, and which factors have the biggest impact on your decisions?
Is this likely to change in the next 5 years? If so, what do you expect will change?

From the perspective of a supplier of microwave and router transmission equipment, we believe that fixed links over microwave will continue to play a major role alongside alternative fibre-based solutions.

Key factors determining the selection of the transmission media include time-to-availability and total cost of ownership. Microwave as a technology can deliver high capacity (>10Gbps) bandwidths over E-Band links, and the availability of such links can be increased with Band and Carrier Aggregation.

In our most recent Microwave Outlook Report, we forecast that by 2030 (when 6G deployment is expected to start) we foresee that 50% of global macro sites will be connected and backhauled through microwave solutions (excluding North East Asia).

Question 4:
Is there anything about Ofcom's current framework for authorising fixed links which you consider could be improved?

We identify the following potential enhancements regarding the current framework:

- Increasing spectrum efficiency with incentivization for Class 4 antennas, ATPC and MIMO
- Guidance regarding the usage of higher modulation schemes combined with Adaptive Coding and Modulation (such as 4096 QAM and 8192 QAM) in line with ETSI recommendations.

Question 12:
Are there other international developments that you are aware of that could affect availability and utility of fixed links in the next 5-10 years?

In our most recent Microwave Outlook Report we forecast that by 2030 (when 6G deployment is expected to start) 50% of global macro sites (excluding North East Asia) will be connected and backhauled through microwave solutions.

Over the past 30 years the demands on these backhaul networks have changed, today in international markets it is common to deploy multiple Gbps of capacity over microwave networks using combinations of the following techniques:

- Wider channel bandwidths – 112 MHz and 224 MHz in the traditional frequency bands, up to 2000 MHz in E-Band.
- Higher modulation schemes combined with the now widely deployed Adaptive Coding and Modulation feature allow for increased spectrum efficiency – modulations of 4096 QAM and 8192 QAM can be used with hitless fallback to lower modulation schemes when environmental conditions require this.
- CCDP technology with cross polarisation interference cancellation – doubling the capacity with 2+0 XPIC radio link bonding.
- Longer distance E-Band links with sway compensating antennas – extending the distance by enabling the use of 0.9m antennas that can provide 80% longer hops than regular 0.3m antennas.
- Multi-band booster for Band and Carrier Aggregation (BCA) support – combining the best characteristics of different frequency bands to further boost capacity. A single dual-band antenna supporting CCDP/XPIC for both traditional and E-Band radios provide a significant increase in capacity and hop length.

Significant untapped potential to densify high-capacity microwave networks is possible through the incentivization of deploying Class 4 antennas. These have sidelobes that are 10-15dB lower than comparable Class 3 antennas, increasing the ability to reuse frequencies in parts of the network. When combined with Automatic Transmit Power Control (ATPC) network capacity can even be doubled.

A further option is line of site multiple-input multiple-output (MIMO for Microwave), which increases the available capacity while still using the same spectrum. A 2x2 MIMO system with optimally spaced antennae can double the bandwidth provided by the microwave link.

Finally, W-band and D-band are untapped high-capacity spectrum resources that can in the future accommodate the needs of both 6G access and fixed wireless links. We envisage that there will be a need in the coming years to be able to initially deploy links on a trial basis, ahead of commercial volumes becoming available.