



Fixed Wireless Access Will Combine with New Use Cases to Drive 5G Surge in High Bands



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Executive Summary

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"Rethink has a commitment to forecasting markets that others shy away from – those on the verge of radical transformation"



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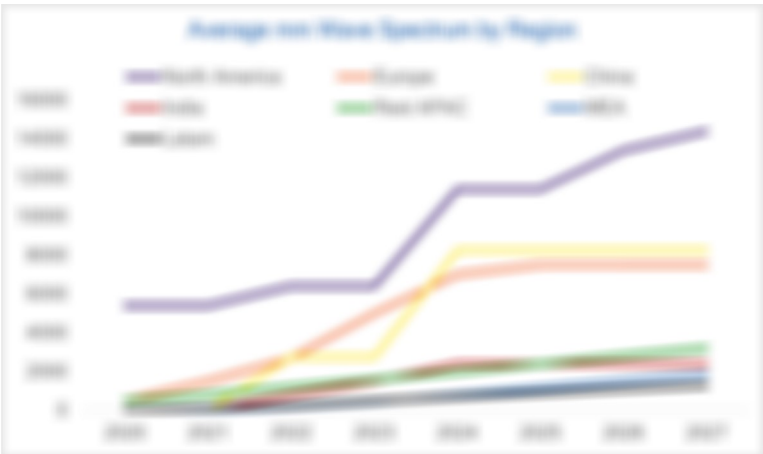
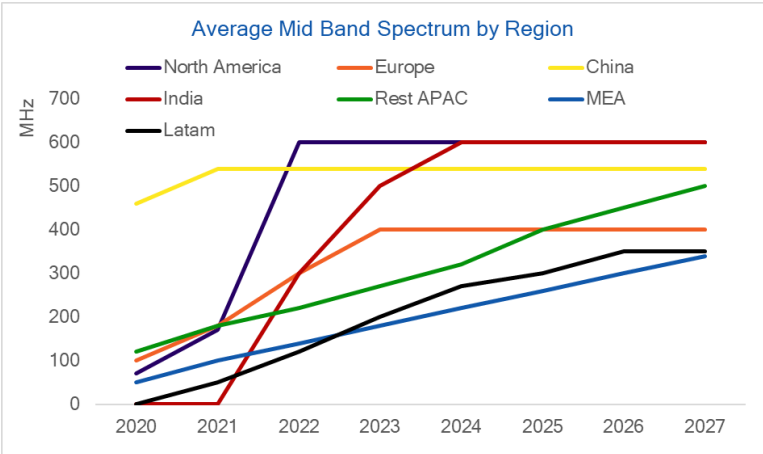


Executive Summary

The 5G revolution will proceed at different rates and directions on a regional basis but continuing rapid expansion of mobile communications riding a wave of new spectrum will be almost universal.

This is reflected in the latest RAN Research forecast which shows the number of cells devoted to 5G expanding in all regions, picking up quickly within a few years even in many countries where spectrum has not yet been made available. There will be rapid expansion in the newer area of private mobile networks driven by vertical sectors such as automotive and manufacturing, where operators face being squeezed out by enterprises working directly with infrastructure providers, led by Germany and Japan.

The 5G boom will begin in the mid band sweet spots between X GHz and X GHz but will then pick up in the higher millimeter wave (mmWave) bands where more spectrum is available but at shorter range. This will lead to rapid proliferation of micro infrastructure, especially small cells, because existing towers are too big and unsightly for the urban settings where mmWave will mostly be deployed, especially at first. The amount of spectrum awarded in the mmWave will dwarf that in the lower bands. This has been acknowledged by the GSMA in recommending contiguous XX to XXX MHz bands being made available in the mid band but a full X GHz in the mmWave zone. This disparity of spectrum is reflected in this forecast, as can be seen from the graph comparing average country assignments.



One consequence is that value attached to spectrum has diverged, with the more plentiful mmWave bands going more cheaply per unit bandwidth. This reflects the lower range at higher frequencies so that the utility is less, with users being more likely to be out of range of a signal.

This disparity can be seen by comparing the number of cells deployed (see methodology) with our projections for data traffic. While the total number of cells devoted to mmWave will overtake those in the mid band by 2027, data volumes will still be behind, despite more bandwidth being available. This reflects the law that spectrum value is a product of range and bandwidth. When refarmed spectrum is taken into account, this being almost entirely in the mid and low bands, the mid band lead in data volumes is even greater than appears at first sight from those graphs.



While some countries, such as India, are prioritizing further 4G expansion before putting full weight behind 5G, the US in particular is pushing harder for 5G now, driven by the pace of China. The difference is that China has been blazing behind the mid band in the belief that will establish a broad swathe of 5G-quality coverage as fast as possible, while in the US Verizon in particular has deployed and promoted mmWave strongly.



The US illustrates the significant differences in 5G strategy that can emerge within single countries, as AT&T emphasized widespread coverage with a low band service while T-Mobile went for a more balanced

ticket spanning the mid band and the high band, aiming to achieve the optimum product of reach and speed.

Much publicity has been given to the three primary use cases of 5G, that is eMBB (Enhanced Mobile Broadband), URLLC (Ultra Reliable and Low Latency Communications) and mMTC (Massive Machine Type Communication), but FWA (Fixed Wireless Access) is becoming the biggest motivator in many regions. This includes developing countries where fixed wired broadband alternatives offer patchy coverage, and also developed nations where it can provide more cost effective reach in rural as well as low density suburban areas.

Several Latin America telcos, for example in Uruguay and Brazil, have already launched FWA 5G services ahead of mobile for this reason. Then among more developed countries, Germany, the UK, Australia and the USA, have been notable for promoting 5G as an FWA service offering affordable broadband at higher bit rates than are available over DSL in rural areas where there is also no coaxial cable TV option. This activity in FWA will have a significant impact on 5G traffic numbers. Taking mobile only, 5G traffic is unlikely to overtake 4G until 2027, but more likely by 2025 when FWA is factored into the equation.

It is hard to forecast precisely how much spectrum will be devoted to FWA because in many cases it will coexist with traditional mobile services. Indeed, one of the attractions of FWA for operators is that it can run largely over existing infrastructure without having to dedicate spectrum.

Indoor wireless communication is the other factor weighing on 5G strategies, at both national and operator levels. China is the only country of note so far to issue dedicated spectrum for indoor coverage, the X.X-X.X GHz band shared between China Telecom, China Unicom and China Broadcasting Network (CBN) for co-developing 5G indoor access networks for economy of scale.

Indoor 5G coverage will be limited in other countries at first, starting with low level spectrum and then expanding into the mmWave for specific use cases in some vertical sectors. As we found from our operator

survey providing the foundation for this report and forecast, a number of operators will rely on WiFi or 4G, or both, for enterprise indoor coverage in the short to medium term. Around XX% of operators stated that they would rely on WiFi as their primary strategy for indoor coverage in the 2021 to 2024 period, with a similar number indicating they would continue to depend mostly on 4G.

Beyond 2024 there is more uncertainty over the detailed course of 5G spectrum and deployment because a lot will depend on the outcome of the next ITU World Radio Conference (WRC2023), but the broad die will have been cast by then. The momentum behind 5G will be already unstoppable.

Another critical factor for 5G at the higher frequencies especially is innovation around antennas and beamforming, which will extend the capacity and range of mmWave where line of sight is available and even increasingly when it is not. This will also trigger a resurgence in wireless for backhaul, particularly in settings where the main alternative of fiber is either not feasible or too costly. The high end XX-XX and XX-XX GHz mmWave bands will be used chiefly for microwave backhaul, because these work best for point-to-point line of sight (LOS) transmission and less well for NLOS in roaming mobile communications.

Methodology

The RAN Research spectrum report and forecast was constructed from a combination of interviews with technology vendors and a survey of 57 leading operators spanning the three principal regions of North America, Europe and Asia Pacific. This provided qualitative information and quantitative data that enabled extrapolation from our previous reports and cross-referencing to data related to RAN build-out patterns and timelines. We were also able to calibrate our projections against publicly available published sources, most notably from the GSMA, as well as records of spectrum auctions either planned or that have already taken place.

We adopted a consistent way of counting cells which equates each of the three 5G bands separately as distinct virtual cells. For instance, a single macro cell can house several virtual cells, potentially one each for low, mid and high band 5G and another for 4G. This approach avoids any confusion in tracking multi-RAT (Radio Access Technology) cells – for instance, in some, 4G and 5G run side by side via DSS (Dynamic Spectrum Sharing) and in others they are implemented as distinct cells. This method can, however, lead to higher cell counts than some other methods, although this report is only addressing 5G and so there is no risk of double counting cells that are also 4G.

Who should buy this report?

Operators – CFOs, senior executives in charge of network planning, network roll-out, infrastructure planning.

Tower operators, fiber operators, other neutral host providers – CxOs, senior sales and client engagement executives.

Vendors – strategy and planning units within a) network equipment providers, b) small cell and enterprise network providers; c) site planning, management and optimisation software for mobile networks and towers; d) antenna suppliers

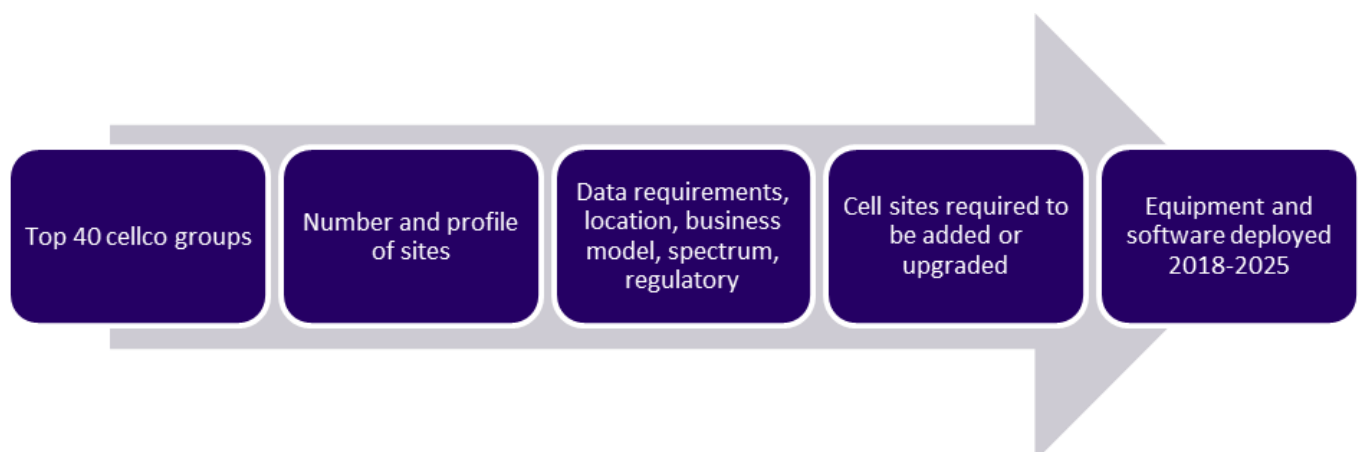
Enterprises – ICT directors, network planners, mobile strategists.

The Rethink RAN Research process summarized

These forecasts were based on a combination of data from:

- Detailed surveys, interviews and operator-by-operator modelling of the IMG-40 groups.
- Studies and modelling of the deployments and strategies of the top 100 4G/5G operators, as tracked by Rethink Technology Research's quarterly surveys, interviews and desk research.
- A survey of 78 tier one operators about their detailed plans for RAN deployments to 2026, and of 28 smaller and alternative operators.
- Input from ecosystem vendors on shipments, technology strategies and competitive landscape, also updated quarterly.
- interviews with other stakeholders such as IoT services providers and enterprises
- a calculation of the resources required in each type of location to achieve the MNOs' stated objectives.

Most of the forecasts refer specifically to nodes deployed within MNO networks, either by themselves or by partners. MNOs may also make use of third party nodes deployed outside their network and connected by wireline or WiFi; and many edge cloud services will run on infrastructure that is not used by MNOs at all.



RAN Research: Forecasting disruption in wireless

Rethink Technology Research is a specialized research and consulting firm with 12 years' experience in surveying wireless, broadband, over-the-top and quad play operators. This has resulted in a broad research base of over 140 service providers (MNOs, telcos, cable and satellite operators, over-the-top providers) worldwide. These organizations are surveyed on a regular basis about their network infrastructure and business plans, and have a relationship of trust with Rethink.

Rethink also has deep relationships with the telecoms ecosystem (tier one device OEMs, vendors, technology developers, integrators, regulators etc), and is perceived as a thought leader in many areas of the telecoms and media sectors. Key areas of expertise and research experience include HetNet migration, small cells and carrier WiFi; transformation strategies for the RAN and the BSS/OSS; convergence of IT and network skills and platforms; device and chipset roadmaps; spectrum strategy.

Here are some sample titles of reports we have produced recently:

- MNOs labor under 5G complexity, tough choices with many partners
- Open RAN adoption patterns and forecast 2020-2026
- Small Cells Drive Microwave Backhaul Boom
- Private networks and shared spectrum making the 5G enterprise a reality
- Is it right to be a Tortoise or Hare in 5G migration
- RAN automation is central to the 5G case—but is it a distant dream?

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About Rethink Technology Research

Rethink is a thought leader in quadruple play, emerging wireless technologies and the energy market. It offers consulting, advisory services, research papers, webinars, plus three weekly research services; Wireless Watch, a major influence among wireless operators and equipment makers; Faultline, which tracks disruption in the video ecosystem, and OTT video; and Rethink Energy, designed to forecast the changing energy landscape and its investment possibilities as renewables begin to take over from conventional fossil fuels.



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Published March 2021

