

Key spectrum bands for the development of 5G and other critical radiocommunication services



STUDY 04 5G & VHCN ECOSYSTEM

An overview for spectrum and telecommunications experts across the EU

AT A GLANCE Radio spectrum is a scarce, finite — yet renewable — national resource, and the way it is managed shapes the competitiveness of every economy. Study 04 analyses how the EU and the Czech Republic can allocate and use key frequency bands to roll out 5G and other critical radiocommunication services. It maps the regulatory framework, the bands in use today, the strategies that extract more capacity from them, and the demand growth that will drive future spectrum policy.

What the study covers

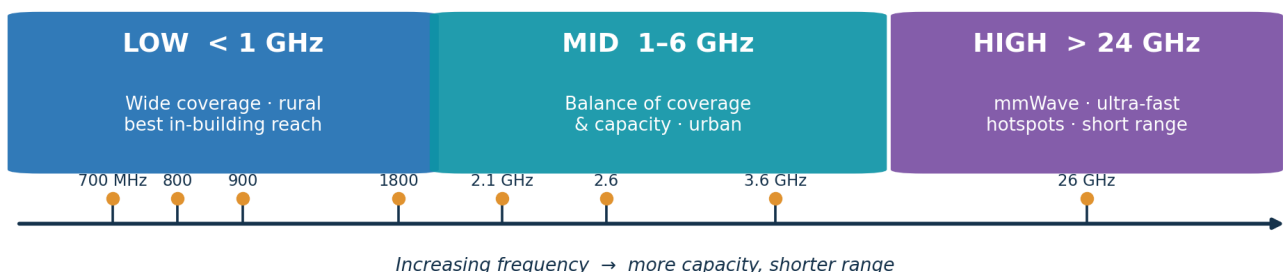
The study links five threads: the technical requirements 5G places on spectrum; the bands available now for mobile, industrial and IoT use; the technical and financial benefits of each band; the regulatory path to repurposing spectrum; and concrete recommendations for national policy.

Why it matters

5G is far more than a faster network. It delivers data rates in the order of gigabits per second, latency in milliseconds, and supports up to one million connected devices per square kilometre — the foundation for IoT, smart cities, connected vehicles and Industry 4.0. Realising this potential depends on having the right spectrum, in the right bands, used efficiently.

Three tiers of spectrum — each with a distinct role

EU pioneer 5G bands: 700 MHz · 3.6 GHz · 26 GHz



No single band does everything: operators combine low, mid and high bands to balance coverage, capacity and cost.

The spectrum landscape in the EU and Czech Republic

- **Pioneer 5G bands.** The EU has harmonised three pioneer bands — 700 MHz for coverage, 3.6 GHz for capacity and 26 GHz for mmWave. The 700 MHz and 3.6 GHz bands have been auctioned in Czechia; 26 GHz is so far used only experimentally.
- **Refarming legacy bands.** Spectrum freed by older services — 2100 MHz (former 3G), 900 MHz and 1800 MHz — is being reassigned to 5G following a 2024 public consultation.

- **Licences to 2029.** The 800 MHz and 2600 MHz bands are held by the three mobile operators under assignments valid until 30 June 2029.
- **On the horizon.** Higher bands such as 6 GHz (flagged at WRC-23) and millimetre waves above 37 GHz are not yet released, but their potential is considerable.

1 million

connected devices per km² — the 5G connection-density target

~48%

10-year CAGR of Czech mobile data per SIM (2014–2023)

3

EU pioneer 5G bands: 700 MHz · 3.6 GHz · 26 GHz

Strategies to get more from every band

Carrier Aggregation

Combines several frequency bands into one wider channel, lifting bandwidth, capacity and speed. Already deployed by operators.

Dynamic Spectrum Sharing

Lets 4G and 5G use the same spectrum at once, allocating it to demand in real time for a smooth, efficient transition.

Spectral refarming

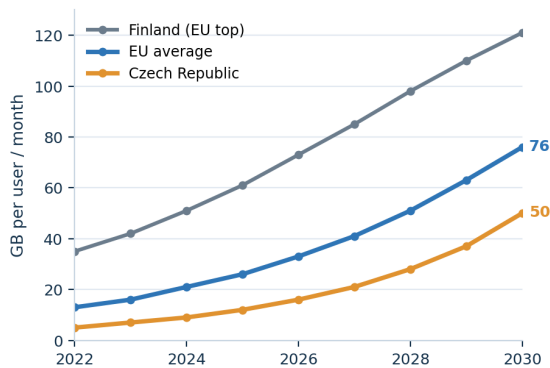
Reassigns spectrum from legacy 2G/3G to 5G, keeping scarce frequencies fully and efficiently employed.

Massive MIMO & beamforming

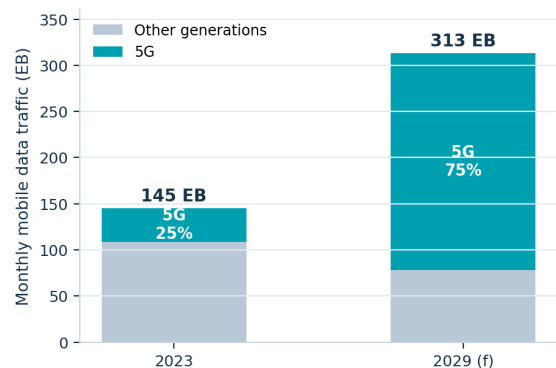
Large antenna arrays plus targeted beams boost cell-edge coverage, capacity and signal quality — tested successfully by Czech operators.

AI-driven spectrum management Machine learning can reduce interference and raise the efficiency of spectrum use — a promising direction already emerging abroad, though still at an early stage.

What demand tells us



Mobile data per user, forecast to 2030 (GB / month).



Global mobile data traffic and the rising 5G share (Ericsson, 2024).

Czech mobile data reached about 9.8 GB per SIM per month in 2023 — a roughly 48% ten-year CAGR — and EU usage is forecast to climb to around 76 GB by 2030, with 5G's share of global mobile traffic rising from 25% to 75% by 2029. Yet some experts argue today's speeds already meet most users' needs, pointing policy toward coverage, quality and price rather than ever-higher peak speeds.

RECOMMENDATIONS — a systematic spectrum strategy

The study calls for moving from ad-hoc decisions to a forward-looking national spectrum strategy that:

- releases additional bands for 5G in good time, with flexible forms of assignment and sharing;
- supports flexible licensing and dynamic spectrum access (DSA), aligned with EU-level proposals;
- avoids fragmenting bands into narrow blocks, preserving room for wide channels;
- tracks application and demand trends — IoT, smart homes, Industry 4.0 — to anticipate future needs;
- balances investment in coverage and service quality against the pursuit of ever-higher peak speeds.

KEY TAKEAWAY Smart, flexible management of low, mid and high spectrum bands — used in combination — is the foundation for resilient, high-capacity 5G and the next generation of radiocommunication services across the European Union.