

HOW THE EU CAN DELIVER THE DIGITAL DECADE

An in-depth study finds Wi-Fi offers much greater technical and economic benefits than IMT in the 6 GHz band in Europe

Europe would see much greater technical and economic benefits by deploying RLAN (radio local area networks) than IMT (international mobile telecommunications) in the upper 6 GHz band (6425-7125 MHz), according to a new report¹. The study found that RLAN (such as Wi-Fi) in the upper 6 GHz band would bring major benefits to five out of the six sectors² prioritised by the EU's Digital Decade

strategy. By contrast, nationally-licensed IMT services would do little to support these sectors.

Produced by LS Telcom and VVA for the Dynamic Spectrum Alliance, the new report is intended to help European regulators, and other stakeholders, understand the specific benefits of utilising the upper 6 GHz band across the different candidate technologies.

	Scenario 1: Nationally licensed IMT	Scenario 2: Locally licensed IMT	Scenario 3: Licence-exempt RLAN
Digital Decade priority sectors most positively impacted by scenario			
Deployment costs	From €5.9 billion to €7.3 billion respectively	€12.35 billion	No additional cost beyond that already committed to the essential upgrade to Wi-Fi 6E
Socio-economic benefits	Twice as many simultaneous users served within the limited coverage area (dense urban areas) compared to simply using 3.5 GHz	No additional users served under this scenario compared to simply using 3.5 GHz	From 3-4 x more simultaneous users compared to currently deployed Wi-Fi 5 and below

Sectors: Agriculture Construction Healthcare Manufacturing Education Public Services

The report considers the technical and economic benefits of three scenarios:

SCENARIO 1: NATIONAL LICENSED WIDE AREA IMT IN THE UPPER 6 GHz BAND

The report concluded that, for both technical and economic reasons, the upper 6 GHz band would only realistically be used for IMT in densely populated areas. About 30% of the EU's population live in such areas, which make up about 1.2% of EU landmass. Providing IMT coverage in the 6 GHz band in these urban centres would require nearly 263,171 small cells, for a total cost of €7.3 billion, or about 65,677 macro sites, at a cost of €5.9 billion.

That investment could double the IMT capacity available in core urban areas, but would not be useful to the six sectors identified in the EU's Digital Decade strategy, according to the report.

The study notes that IMT services in the upper 6 GHz band would a) be unable to effectively penetrate buildings, b) be attenuated by vegetation with very limited diffraction around obstacles, and c) only be able to support localised line of sight applications outdoors.

It concludes that wide area deployment of licensed IMT small cells and/or macro sites in the upper 6 GHz band is unlikely to be economically viable due to the cost of network rollout, the limited applicability outside densely populated urban areas, and the cost of mitigating potential interference to incumbent users.

SCENARIO 2: LOCAL LICENSED IMT IN THE UPPER 6 GHz BAND

Locally-licensed IMT in the upper 6 GHz band could benefit three out of six sectors prioritised by the EU's Digital Decade strategy (construction, healthcare, manufacturing), according to the study. But deploying locally-licensed IMT across the EU's 18,557 organisational campus networks would cost about €12 billion. Further, this scenario will not support additional users compared

¹ Socio-economic benefits of IMT versus RLAN in the 6425-7125 MHz band in Europe. Available at: https://www.dynamicspectrumalliance.org/wp-content/uploads/2022/08/DSA-IMT-RLAN_6425-7125MHz-EU_Study-August-2022.pdf

² Construction, healthcare, manufacturing, education, public services and agriculture.

to the baseline scenario in 3.8-4.2 GHz (the spectrum earmarked for local licences in the EU), as the extra bandwidth and capacity would not be utilised.

The study also cautions that the upper 6 GHz band provides a smaller coverage area than lower frequency bands and does not propagate as well in cluttered environments, meaning more sites will need to be deployed. It concludes that the amount of spectrum that is becoming available in mid-bands below 4.5 GHz should be sufficient to meet the needs of local IMT deployments by organisations, even for demanding use cases involving multiple video cameras for live streaming (body-worn cameras or cameras mounted on vehicles).

SCENARIO 3: RLAN/WI-FI 6E AND 7 ACROSS THE 6 GHZ BAND

RLAN/Wi-Fi in the upper 6 GHz band would benefit five of the six sectors (construction, healthcare, manufacturing, education and public services) prioritised by the Digital Decade strategy, the study found. Further, new Wi-Fi technologies (Wi-Fi 6E and Wi-Fi 7) in this band would be able to serve three to four times more users compared to currently deployed Wi-Fi. There will be no additional deployment costs, as most organisations and households will upgrade to Wi-Fi 6E equipment over time anyway³, and all of this equipment will support the upper 6 GHz band. Europe is already committed to upgrading to Wi-Fi 6E, which will cost between €9.76 billion (to equip all existing EU broadband subscribers with a Wi-Fi 6 router) and €13.25 billion (if every household, every registered company and every registered NGO were to have its own connection), according to LS Telcom.

On comparing Wi-Fi use of the full 1200 MHz with just the lower 500 MHz portion of the 6 GHz band, the study found that access to the entire band enables additional capacity and quality of service (QoS) benefits. Specifically, the full 1200 MHz enables more wider bandwidth channels (160/320 MHz) enabling full 1 Gbps connectivity, in line with the EU's 2025 target. As advanced Wi-Fi technologies can enable multi-gigabit connectivity, they would also be able to support more demanding targets that the EU might implement in future. Access to the full 6 GHz band will also ease congestion in 2.4 GHz and 5 GHz networks in densely populated areas, resulting in an overall uplift in quality of service for existing Wi-Fi users.

This is important because Wi-Fi demand in residential environments could grow between six and ten times between 2020 and 2030, driven by increased video quality and the adoption of virtual reality devices and applications⁴. In public venues, such as arenas or concert halls, demand could increase up to 15 times over the same period.

COEXISTENCE WITH INCUMBENT SERVICES

The study noted that it may be difficult for incumbent fixed and fixed satellite services to coexist with IMT networks in the upper 6 GHz band. It estimated the cost of moving fixed services to another band to be between €3.2 billion and €4.7 billion (based on the C-band migration in the US), beyond the deployment costs cited in the scenarios.

In any case, coexistence with fixed satellite services will likely require the deployment of major mitigation measures and possibly coordination of deployment across several countries and even regions, limiting the deployment of IMT in this band. By contrast, the use of RLAN/Wi-Fi in the lower 6 GHz portion has proven coexistence is possible with incumbents. Now CEPT is conducting similar studies for the upper 6 GHz band, with an expectation that coexistence is possible.

AVAILABILITY OF COMPATIBLE DEVICES

Furthermore, Wi-Fi routers and numerous other devices capable of operating across the full 6 GHz band (Wi-Fi 6E equipment) are widely available today, whereas compatible IMT equipment is unlikely to be available until the second half of this decade. The Wi-Fi Alliance has now certified 620 Wi-Fi 6E products, as computer, tablet, smartphone and consumer electronics suppliers embrace the new technology.

As the Wi-Fi 6E market grows, economies of scale are kicking in, ensuring that Wi-Fi technology will continue to be highly affordable. The Wi-Fi Alliance projects more than 350 million Wi-Fi 6E devices will be shipped in 2022. Grand View Research has forecast that the Wi-Fi 6E chipset market will grow rapidly and that in 2028 almost 4 billion Wi-Fi 6E chipsets will be shipped globally, with an annual CAGR of 40.9% from 2021 to 2028.

³ To access the lower 6 GHz band (5945-6425 MHz), which is now licence-exempt in Europe

⁴ See UK Ofcom Improving Spectrum Access for Wi-Fi, July 2020, at ¶ 3.24, available at https://www.ofcom.org.uk/_data/assets/pdf_file/0036/198927/6ghz-statement.pdf