June 14, 2025

Mr Devendra Kumar Rai

Joint Secretary (Telecom),

Department of Telecommunications,

Ministry of Communications, Government of India,

Sanchar Bhawan, 20 Ashoka Road,

New Delhi – 110001

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Re: Draft rules titled 'Use of Low Power and Very Low Power Wireless Access System including Radio Local Area Network in Lower 6 GHz band (Exemption from Licensing Requirement) Rules, 2025', issued for public consultation on May 16, 2025

Dear Mr Devendra Kumar Rai,

The Dynamic Spectrum Alliance[1] (DSA) respectfully submits the following comments in response to the Department of Telecommunications (DoT)'s draft regulations concerning license-exempt use of the lower 6 GHz band (5925–6425 MHz) for Radio Local Area Networks (RLANs).

The DSA commends the Government of India and DoT for permitting license-exempt operation of Low Power Indoor (LPI) and Very Low Power (VLP) indoor/outdoor devices in the lower 6 GHz band. These

[1] The DSA is a global, cross-industry, not for profit organization advocating for laws, regulations, and economic best practices that will lead to more efficient utilization of spectrum, fostering innovation and affordable connectivity for all. Our membership spans multinationals, small-and medium-sized enterprises, as well as academic, research and other organizations from around the world all working to create innovative solutions that will benefit consumers and businesses alike by making spectrum abundant through dynamic spectrum sharing. A full list of DSA members is available on the DSA's website at https://www.dynamicspectrumalliance.org/members.

draft rules position India to benefit from the global momentum behind Wi-Fi 6E, Wi-Fi 7, and emerging connectivity technologies. The draft rules represent a timely and strategic step that will improve broadband performance, stimulate local innovation, support India's national priorities under the Digital India and BharatNet initiatives, and overall benefit the country's residents and businesses.

Even greater benefits could be achieved by DOT opening the entire 6 GHz band (5925 – 7125 MHz) to three categories of license-exempt devices – LPI, VLP, and higher power "Standard Power" devices that can operate indoors and outdoors under control of an Automated Frequency Coordination (AFC) system.

The DSA offers these comments in the spirit of collaboration. Our aim is to provide constructive, evidence-based recommendations to support a regulatory framework that is practical, scalable, and conducive to investment. Drawing on our global expertise in dynamic and shared spectrum access, we are committed to assisting the DoT in ensuring that the policy fully realizes its socioeconomic and technological potential.

The DSA appreciates the opportunity to contribute to this important consultation and would welcome continued dialogue with the DoT as the regulatory process moves forward.

Sincerely,

Dr. Martha Suárez

President

Dynamic Spectrum Alliance

DSA comments to Draft rules titled 'Use of Low Power and Very Low Power Wireless Access System including Radio Local Area Network in Lower 6 GHz band Rules

1. The Strategic Role of License-Exempt Spectrum in India's Digital Future

The 6 GHz band represents a critical opportunity for India to enable high-capacity, low-latency broadband networks without the economic and operational barriers of licensed spectrum. License-exempt access to this band supports:

- Wi-Fi 6E and Wi-Fi 7 deployments, providing the speed, capacity, and responsiveness required for applications such as AR/VR, telemedicine, education, and Industry 4.0.
- PM-WANI (Prime Minister's Wi-Fi Access Network Interface) expansion through public Wi-Fi, community networks, and rural broadband, reducing backhaul costs and increasing quality of service. Wi-Fi networks can be connected to the edge of a fibre network or a satellite network for that matter, to provide for local access.[2]
- The government's goal of universal digital inclusion as outlined in Digital India and BharatNet initiatives.

India's growing population of connected devices and rising demand for indoor data in dense deployment environments underscore the need for more license-exempt mid-band spectrum. Opening the lower 6 GHz band is an important step to providing this license-exempt capacity. Nevertheless, over time, on a time scale much faster than the DSA believes DOT anticipates, without the ability to utilize the entire 6 GHz band, Wi-Fi infrastructure will face increasing congestion and performance degradation. Opening the entire 6 GHz band to license-exempt operations supports the continued evolution of Wi-Fi technologies (Wi-Fi 6E, Wi-Fi 7), which require wider channels (e.g., 160 MHz and 320 MHz) to meet future connectivity demands. The lower 6 GHz band will only support a single 320 MHz channel.

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[2] SES and Mexican CFE TEIT Leverage SES-17 Satellite to Enable Free Broadband Hotspots across Mexico | SES

2. The Role of Spectrum Expansion in Advancing Digital Innovation

Expanding access to license-exempt spectrum in the 6 GHz band is essential to support India's rapidly growing demand for high-performance wireless connectivity. This spectrum is critical for enabling next-generation digital applications such as AR/VR, smart manufacturing, and telemedicine, while empowering startups and MSMEs to innovate without the constraints of costly licensed access. The 6 GHz band offers a unique opportunity to more than double current Wi-Fi capacity, accelerate the deployment of Wi-Fi 6E and Wi-Fi 7, and deliver multi-gigabit, low-latency performance. Global evidence confirms that license-exempt use of this band can coexist safely with incumbent services. Aligning with international trends will unlock economic scale, reduce device costs, and position India as a leader in digital infrastructure and inclusive innovation.

- **Escalating Demand for license-exempt Spectrum**
  - ✓ Existing license-exempt bands at 2.4 GHz and 5 GHz are increasingly congested and no longer sufficient to meet the growing performance demands of modern digital services. Applications such as immersive AR/VR, industrial automation, precision agriculture, telemedicine, and high-density IoT require broader channels, lower latency, and higher throughput than these legacy bands can support. Expanding access to license-exempt spectrum in the lower 6 GHz band is a critical first step to ensuring that public and private networks can deliver the quality of service expected in healthcare, education, manufacturing, government, and smart cities.

- **Enabling Startups, MSMEs, and Grassroots Innovation**
  - ✓ India's vibrant technology ecosystem particularly its startups and MSMEs depends on accessible and affordable wireless infrastructure to scale digital solutions in areas like logistics, e-learning, training, and telemedicine. Access to delicensed spectrum in the 6 GHz band would remove the financial and other barriers posed by licensed spectrum regimes, enabling innovators to deploy next-generation connectivity solutions faster and more widely.

- **Strategic Importance of the 6 GHz Band**
  - ✓ The 6 GHz band (5925–7125 MHz) provides 1200 MHz of clean, contiguous mid-band spectrum and more than doubling the bandwidth currently available to Wi-Fi networks.

This expanded spectrum enables the deployment of Wi-Fi 6E and Wi-Fi 7, which deliver multi-gigabit speeds, low latency, and the capacity to connect hundreds of devices simultaneously. These features are vital for emerging use cases such as real-time cloud gaming, collaborative mixed-reality workspaces, autonomous manufacturing, and smart public infrastructure. Allocating this band for license-exempt use positions India for long-term digital leadership.

- **Proven Coexistence with Incumbent Services**
  - ✓ Extensive studies and real-world deployments in multiple countries have demonstrated that LPI and VLP license-exempt RLANs can coexist with incumbent Fixed Satellite Service (FSS) and Fixed Service (FS) operations in the 6 GHz band without causing harmful interference.

- **Global Momentum and Economic Opportunity**
  - ✓ More than 75 countries[3] have adopted rules permitting license-exempt operations over portions, or the entire 6 GHz band, contributing to a harmonized international market for devices, equipment, and services. This global momentum has catalysed a thriving ecosystem of Wi-Fi 6E and Wi-Fi 7 products, resulting in lower device costs, increased innovation, and faster adoption. Aligning India's spectrum policy with this global trajectory will unlock economies of scale, promote cross-border interoperability, and reduce the cost of broadband infrastructure. Most importantly, it will advance India's national goals for digital inclusion, rural connectivity, and economic resilience.

3. Aligning with Global Momentum and Market Readiness

India is at a pivotal moment in shaping its wireless spectrum strategy to meet the needs of a digitally empowered population and a fast-growing innovation ecosystem. The country can leverage the emerging global ecosystem for Wi-Fi 6E and Wi-Fi 7 equipment.

[3] https://6ghz.info/#MAP

a. Global Adoption & Ecosystem Development

The 6 GHz band represents the largest contiguous mid-band spectrum made available for license-exempt use in over two decades. It is purpose-built for technologies like Wi-Fi 6E and Wi-Fi 7, which are engineered to deliver multi-gigabit download and upload speeds, ultra-low latency for real-time responsiveness, enhanced spectral efficiency and spatial reuse and the ability to support hundreds of devices per access point.

Intel has reported that, as of the end of 2024, more than 5,000 device models support 6 GHz Wi-Fi, encompassing both Wi-Fi 6E and Wi-Fi 7 technologies. This rapid adoption underscores the significant market momentum behind these standards.[4] The Wi-Fi Alliance has forecasted that Wi-Fi 7 device shipments will reach approximately 2.1 billion units by 2028, highlighting the anticipated widespread adoption of this next-generation Wi-Fi standard.[5] Chipset vendors such as Broadcom and Intel have released multi-band platforms supporting 2.4 GHz, 5 GHz, and 6 GHz operations, ensuring that devices built for this spectrum are globally interoperable and economically scalable. Device vendors across the globe, including Apple, HPE and Cisco are actively deploying or certifying 6 GHz-capable products, making this band foundational to both consumer and enterprise connectivity.

By aligning with this global momentum, India can realize tangible benefits across technology, economics, and national policy goals.

- **Economies of Scale and Supply Chain Access**
  - ✓ Regulatory harmonization ensures that device and chipset manufacturers can serve the Indian market without modification, reducing development costs and accelerating time-to-market.
  - ✓ Indian manufacturers benefit from access to standardized components, enabling the domestic production of affordable, high-performance wireless equipment under the Make in India initiative.

- **Lower Consumer and Network Equipment Costs**

[4] https://wifinowglobal.com/news-and-blog/massive-market-adoption-5000-wi-fi-devices-now-support-6-ghz-1230-support-wi-fi-7-intel-says/

[5] https://www.wi-fi.org/system/files/Wi-Fi_Alliance_Insider_202401.pdf

- ✓ Global demand has led to dramatic reductions in the cost of Wi-Fi 6E/7 chipsets and devices, making enterprise-grade performance affordable for homes, businesses, and institutions.
- ✓ This enables wider deployment of high-capacity Wi-Fi infrastructure in schools, healthcare facilities, smart cities, and manufacturing zones.

- **Accelerated Deployment of Advanced Connectivity**
  - ✓ License-exempt 6 GHz access reduces regulatory delay, spectrum acquisition costs, and deployment complexity.
  - ✓ Wi-Fi 7 capabilities—enabled only by the 6 GHz band—are essential for emerging applications like real-time cloud gaming, AR/VR collaboration, low-latency telemedicine, digital twin simulations, and autonomous systems in logistics and industry.

- **Cross-Border Interoperability and Global Trade Alignment**
  - ✓ Harmonized spectrum policy allows Indian consumers and enterprises to seamlessly operate devices across international markets—essential for travel, logistics, exports, and foreign investment.
  - ✓ Regulatory alignment enhances India's ability to attract global wireless ecosystem investment and participate in international standards development bodies.

b. Strategic Positioning for India

India's decision to adopt a license-exempt framework for the lower 6 GHz band is a vital step toward ensuring compatibility with international best practices. To fully leverage this momentum, India should continue to:

- Strengthen its broadband infrastructure by making available the full 6 GHz band for license-exempt use in phases.
- Encourage domestic innovation and investment by enabling the deployment of globally standardized wireless equipment.
- Advance digital inclusion and rural connectivity, ensuring that communities across India benefit from fast, reliable, and affordable broadband.
- Consider license-exempt standard power operations under control of an AFC to provide fixed

wireless broadband access to unserved and underserved populations.

By fully integrating into the global 6 GHz ecosystem, India stands to maximize the economic, technological, and societal benefits of license-exempt spectrum, solidifying its leadership in the global digital economy and ensuring that high-performance connectivity is accessible to all citizens.

4. Recommended Enhancements to Proposed Rules

To ensure that India's regulatory framework for license-exempt use of the 6 GHz band delivers on its full socioeconomic and technical potential, the DSA respectfully proposes the following enhancements to the draft rules:

a. Opening the Entire 6 GHz Band to License Exempt Use

The DSA encourages India to adopt a longer-term spectrum policy objective of opening the entire 6 GHz band (5925–7125 MHz) for license-exempt use. This forward-looking strategy aligns with emerging international best practices and maximizes the long-term benefits of spectrum allocation for digital transformation. Expanding access to the full 1200 MHz offers several compelling advantages:

- **Enables Next-Generation Wireless Technologies**
  - ✓ The full 6 GHz band is essential to realize the performance potential of Wi-Fi 7, which introduces 320 MHz channels, multi-link operation, and extremely low latency required for future applications.
  - ✓ These capabilities support demanding use cases such as immersive AR/VR, real-time cloud rendering, industrial digital twins, and precision robotics, all of which require wider bandwidth and interference-free environments.

- **Promotes International Harmonization and Device Ecosystem Compatibility**
  - ✓ Over a dozen countries, including the United States, Canada, South Korea, Saudi Arabia, and others, have already authorized license-exempt access to the full 1200 MHz.
  - ✓ Aligning with this trend ensures interoperability with globally marketed devices and positions India as a strategic partner in the international wireless technology supply chain.
  - ✓ Harmonization reduces device costs and accelerates deployment by allowing Indian manufacturers and consumers to adopt standard, globally supported equipment.

- **Supports a Scalable, Inclusive Connectivity Model**
  - ✓ A full-band approach ensures sufficient license-exempt spectrum is available to support high-speed broadband access in enterprises, homes, multi-dwelling units, educational institutions, stadiums, public Wi-Fi and community network deployments at scale, especially in India's high-density environments.
  - ✓ All other things being equal, the greater the amount of license-exempt spectrum available, the lower the capital expenditure required to build public Wi-Fi and community networks, making more efficient use of the government's investment. The alternative is to densify the network by adding more access points to achieve comparable performance, which means either lesser performance or fewer public Wi-Fi stations than otherwise possible.

b. Increase Power Spectral Density (PSD) Limits for LPI and VLP Devices

- **Low Power Indoor (LPI) Devices**: The DSA recommends increasing the maximum mean PSD e,i.r.p to 10 dBm/MHz, consistent with EU regulations.[6] This adjustment enables stronger signal coverage, improved indoor penetration (especially in buildings with dense materials), and higher spectral efficiency. It is particularly beneficial for enterprise networks, high-density indoor deployments, and mesh Wi-Fi systems.
- **Very Low Power (VLP) Devices**: For portable, battery-powered devices such as AR/VR headsets, wearables, and short-range smart home equipment, the DSA recommends a PSD of 1 dBm/MHz. This level strikes the right balance between device performance and interference avoidance, especially when accounting for body loss and variable user positioning. This value aligns with technical rules in the EU for the maximum mean PSD e.i.r.p. for in-band emissions.[7]
- Increasing these PSD limits ensures that both consumer-grade and enterprise-grade deployments can operate efficiently while preserving coexistence with incumbent services.

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[6] European Commission, "COMMISSION IMPLEMENTING DECISION (EU) 2021/1067 of 17 June 2021 on the harmonised use of radio spectrum in the 5 945-6 425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs) (notified under document C(2021) 4240)" (Publications Office).

[7] *Id.*

c. Permit LPI Access Points (APs) use of connectorized antennas for enterprise deployments

The proposed regulation from DoT requires AP to use in-built antenna. However, in many dense enterprise environments such as office buildings, airports, shopping malls, and educational campuses, the use of non-integrated, externally connected antennas becomes highly beneficial. External connected antennas offer improved directivity by concentrating the RF energy into a narrower beam, reducing spillover into adjacent areas. This focused radiation pattern not only limits interference with nearby APs operating on the same channel but also enables the reuse of spectrum in closer proximity, ultimately enhancing overall network efficiency and throughput.

Additionally, APs equipped with non-integrated directional antennas can significantly enhance uplink performance. User equipment typically has a much lower e.i.r.p. than AP, directional antennas with higher receive gain can increase reception signal level, ensuring more reliable connectivity and consistent performance across the network.

The requirement for LPI APs to use integrated antennas stems from concerns among regulators that users may replace antennas to exceed regulatory e.i.r.p. limits. This concern is shared by DSA as well. We therefore recommend a targeted exemption approach by only allowing certified enterprise Wi-Fi providers to use dedicated external antennas, with built-in software control to enforce regulatory power limits. This would balance regulatory assurance with deployment flexibility.

d. Employ contention based protocols for fair channel access

We request the DoT to also consider introducing mandatory contention based protocols in the Draft Rules to ensure the long-term utility of the band. Our goal is to ensure that license-exempt technologies share fairly, i.e., (1) their use of the band scales proportionately with the number of active devices in a given location, and (2) one technology does not unfairly hinder the other technology from successfully using the band. A contention based protocol is a spectrum access mechanism that enables wireless systems to share the same frequency band (in this case the 6 GHz band) without causing harmful interference to each other. To elaborate, contention based protocols work by ensuring that a device “listens” to the channel before transmitting and only transmits if the channel is clear (i.e., a “listen before talk” method). If the channel is busy, the device waits for a random period before retrying. This dynamic behaviour promotes fair coexistence among multiple users of license-exempt spectrum. Contention based protocols are particularly important in license-exempt bands, such as the

6 GHz band, where different technologies must operate without centralized coordination.

Incorporating Contention Based Protocols as a mandatory requirement in the Draft Rules for the 6 GHz band is not only technically sound and globally consistent, but also strategically important for India's digital future. This step will ensure harmonious spectrum sharing, and enable the growth of a robust, fair, and inclusive wireless ecosystem in India.

Conclusion

The DSA commends the Government of India and DoT for their forward-looking approach to spectrum policy and digital connectivity. The proposed authorization of the 6 GHz band for license-exempt use represents a pivotal step toward enabling affordable, high-capacity broadband access across urban and rural India alike.

Unlocking this vital mid-band spectrum for license-exempt technologies such as Wi-Fi 6E and Wi-Fi 7 will empower a wide range of stakeholders. It will significantly enhance indoor and campus connectivity, support innovation in sectors such as healthcare, education, manufacturing, and agriculture, and contribute to India’s broader goals under the Digital India and BharatNet initiatives.

The DSA encourages continued momentum toward harmonizing with international best practices, including a roadmap for future access to the full 1200 MHz of the 6 GHz band. Doing so will unlock long-term socioeconomic benefits, stimulate domestic manufacturing, and ensure India remains at the forefront of global digital transformation.

The DSA stands ready to collaborate with the DoT and the Ministry of Communications in providing technical expertise, international benchmarks, and stakeholder engagement support to ensure the successful implementation of this important policy. The DSA looks forward to continued dialogue as India builds a more inclusive and future-ready digital ecosystem.