Dated: 27-10-2025

IAFI/2025-26/L-238

To,

Shri Akhilesh Kumar Trivedi,
The Advisor (Networks, Spectrum & Licensing)
Telecom Regulatory Authority of India (TRAI),
4th, 5th, 6th & 7th Floor, Tower-F,
World Trade Centre, Nauroji Nagar,
New Delhi – 110029

Ref: Consultation Paper No. 8/ 2025

Subject: IAFI Comments/Suggestions on the Consultation Paper regarding "The Auction of Radio Frequency Spectrum in the Frequency Bands Identified for International Mobile Telecommunications (IMT)" released on September 30, 2025.

Dear Sir,

The ITU-APT Foundation of India (IAFI[1]) sincerely thanks and appreciates the Telecom Regulatory Authority of India (TRAI) for releasing the comprehensive Consultation Paper on September 30, 2025, regarding 'The Auction of Radio Frequency Spectrum in the Frequency Bands identified for International Mobile Telecommunications (IMT)', providing an opportunity to the stakeholders to submit their views on this critical matter.

IAFI recognizes that the traditional **spectrum auction model**—long celebrated as a transparent and efficient way to allocate public airwaves—is increasingly becoming obsolete in the 5G era. Once a hallmark of market-based policy, current auction methodology acts as a **barrier to innovation, competition, and equitable digital growth**. As telecom networks expand and require vast, flexible, and affordable

[1] See Attachment 3 for information about IAFI. Further Details are available at our website https://iafi.in

spectrum access, high auction costs have become a financial burden on operators. In India, for instance, spectrum sales and revenue have sharply declined, reflecting industry fatigue after years of heavy investment. For example, the latest **2024 5G spectrum auctions, less than 1.34% of available spectrum** was sold, **generating only ₹11,340 crore compared to ₹150,000 crores** in 2022 — a striking sign of diminishing enthusiasm among telecom operators. Similar trends are evident globally, where even the U.S. Federal Communications Commission has been signaling a broader rethink of how spectrum should be managed. Economists now argue that auctions distort priorities—rewarding wealth over innovation, restricting new entrants, and In our view, the **era of auctions is ending**. Therefore, TRAI must rethink the current auction model. **High Reserve prices** hinder digital inclusion and rural coverage while reducing funds for network rollout. Instead, policies should treat spectrum as a **public enabler of growth**, not a short-term fiscal asset. Recommended reforms include **Zero reserve price,** use-based payments based on revenue sharing models, and direct assignment for private, captive and strategic uses. By prioritizing efficient use and open access over revenue maximization, TRAI can accelerate connectivity, foster competition, and prepare for the 6G and IoT future—where flexibility, affordability, and innovation matter more than who can pay the most.

In this context, IAFI is pleased to forward the detailed comments and suggestions on issues raised in the Consultation Paper. Our submission provides a point-by-point response to the specific questions posed, focusing on key areas such as:

a. Reserve price may be aligned with the current demand and market valuation. Current design flaw is due to the High, Static Reserve Prices, which often act as a ceiling rather than a floor, leading to massive unsold inventory. We Recommend ZERO reserve price for all frequency bands
b. We recommend to move away from the current Simultaneous Multiple Round Auction (SMRA) to a more modern, package-centric format like the Combinatorial Clock Auction (CCA), complemented by procedural reforms.
c. IAFI strongly supports the inclusion of the **600 MHz band (612–652 MHz / 663–703 MHz) in this round**, aligned with the **APT 600 MHz Band Plan (3GPP Band n105)**, as ecosystem challenges that kept it unsold in 2022—

such as limited standardization and device readiness—have now been resolved through global progress. The band has gained momentum, with adoption in countries like **Saudi Arabia, UAE, New Zealand, Vietnam, and India**, backed by international coordination through the **ITU and 3GPP**. Its inclusion in 3GPP standards has driven widespread **chipset and device support** from vendors such as Qualcomm, enabling rapid commercial rollout. Offering **excellent propagation characteristics**, the n105 band provides a cost-effective solution for expanding **nationwide 5G coverage**, improving rural connectivity, and enhancing in-building penetration in urban areas. Given its harmonized, FDD-based 40 MHz paired structure, already endorsed by **TRAI** and globally standardized, APT 600 MHz (n105) represents the optimal choice for **efficient and inclusive spectrum utilization** across the Asia-Pacific region.

d. **IAFI fully supports the IMT in the upper 6GHz band** and its timely auction. This band is critical for India's 6G vision, and its allocation needs to be linked to the future 7 -8 GHz spectrum likely to be allocated for 6G at WRC-27. **The combined 6425-8400 MHz spectrum band is likely to provide up to 4 contiguous Blocks of 400 MHz** each to meet the future needs ultra broadband connectivity by upto 4 Mobile operators. Therefor the planning of the 6 GHz auction needs to consider future 400 MHz contiguous blocks.

   (i) India is at a critical crossroads in shaping its 6G future, and the Upper 6 GHz band (6425–6725 MHz and 7025–7125 MHz) is seen as a vital asset in this journey. The recommendation is to reserve this spectrum for International Mobile Telecommunications (IMT) and delay any auction until after the World Radiocommunication Conference 2027 (WRC-27). This would allow India to align with global harmonization efforts and explore the potential of a contiguous spectrum extending into the 7–8 GHz range. Premature auctioning could lead to misalignment with international standards, resulting in fragmentation, interference, and higher costs for equipment and deployment.

   (ii) The 6425–7125 MHz band is considered greenfield spectrum, largely free from legacy systems, so making it ideal for 6G, which demands clean,

high-capacity, and low-latency frequencies. Auctioning this band for current technologies like 5G could lead to inefficient use and costly refarming in the future. Furthermore, 6G is expected to require 200–400 MHz of mid-band spectrum per operator, and the Upper 6 GHz and adjacent bands offer a unique opportunity to meet this demand. Reserving this spectrum ensures that operators have access to the necessary resources for delivering world-class 6G services.

(iii) Aligning with the Prime Minister's vision for India as a global 6G leader, the Bharat 6G Vision Document and the Bharat 6G Alliance (B6GA) emphasize the importance of this "golden band" for future innovation. Preserving it supports indigenous development, global collaboration, and leadership in setting international standards. Delaying the auction until after WRC-27 not only aligns with global trends, mirroring the approaches of countries like China and Brazil—but also reinforces India's strategic and economic interests. The recommendation is clear: earmark the entire Upper 6 GHz band for IMT and revisit its allocation post-WRC-27 to ensure long-term national and global benefits.

e. Band plan for L Band – IAFI was actively involved in IMT identification work during WRC-2015 cycle. With mid-range TDD spectrum opening up for 5G deployments, there is a need to open up a lower frequency range (e.g. L Band) for meeting uplink demand, specifically for enhancing indoor coverage. The L Band (1427–1518 MHz) stands out as an optimal choice for Supplemental Uplink (SUL) in 5G networks due to its superior propagation characteristics compared to higher frequency bands like 3.5 GHz and 6 GHz. Its lower frequency allows signals from user devices, often constrained by limited power—to travel farther and penetrate obstacles such as buildings and foliage more effectively. This ensures reliable uplink connectivity even in dense urban environments. Unlike downlink transmissions, which benefit from high-powered base stations and advanced antenna arrays, uplink relies on lower-powered user equipment, making the L Band's favorable link budget crucial for maintaining robust performance. Historically, its propagation advantages also led to its use in enhancing downlink coverage in the 2100 MHz band across

parts of Europe. As telecom networks evolve to meet the surge in uplink traffic driven by applications like video calls, live streaming, and IoT data uploads, the L Band offers a strategic solution. Its wide coverage per cell and reduced interference support efficient network planning and resource reuse. By pairing the L Band with mid-band downlink carriers, operators can create a balanced dual-band system that ensures high downlink throughput and strong uplink reliability. This approach addresses the asymmetry in 5G networks, improving service quality across all user locations. Moreover, the L Band's existing allocations and compatibility with current technologies make it economically viable, reducing deployment costs while enhancing overall network performance.

The enclosed Attachment 1 and Attachment 2 contains our analysis and recommendations, which we believe will contribute constructively to TRAI's final recommendations to the Department of Telecommunications (DoT) and promote a transparent, optimal, and forward-looking spectrum auction framework.

We request you to kindly consider our comments and suggestions during the finalization of the recommendations. We would also be happy to participate in any Open House Discussion or meeting, should TRAI deem it necessary for further clarification on our submission.

We look forward to collaborating with the TRAI and IAFI is available for any further discussions that may be required.

Warm Regards,

Bharat B Bhatia,
President, ITU-APT Foundation of India (IAFI)
Vice Chairman, World Wireless Research Forum (WWRF)
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Attachments:

- Attachment 1: Our paper on need for overall Review of Spectrum Auctions as a mechanism for spectrum assignment.
- Attachment 2: Detailed Comments and Suggestions on the Consultation Paper
- Attachment 3: Brief about the ITU-APT Foundation of India (IAFI)

Copy to:

1. Secretary, Telecom
2. Addl. Secretary, Telecom
3. Member (T) /Member (S) /Member (F), DCC
4. WA/JWA(R)/ JWA(P)/Director WMO
5. PS to Hon'ble MOC
6. PS to Hon'ble MOS-C

Attachment 1

The Erosion of the Spectrum Auctions as a way of assigning Spectrum to Mobile Operators

By: Bharat Bhatia, President, ITU-APT Foundation of India (IAFI)

As nations increasingly view connectivity as critical public infrastructure, akin to roads or electricity — the case for collaborative, flexible, and equitable spectrum management grows stronger. The future of wireless technology depends not on who can pay the most, but on who can use spectrum most efficiently and inclusively. For decades, spectrum auctions have been the cornerstone of how governments allocate valuable wireless frequencies to telecom operators. Since their introduction in the 1990s, these auctions have raised hundreds of billions of dollars globally and were celebrated as a fair and efficient mechanism to distribute scarce public resources. However, as 5G networks roll out worldwide, the traditional model of spectrum auctions is showing its age. What once seemed like a triumph of market-based economics is increasingly seen as a barrier to innovation, competition, and long-term economic health.

In that light, spectrum auctions are indeed going out of fashion — not because they failed entirely, but because the world has outgrown them. The digital economy demands a new approach, one built on cooperation, innovation, and shared access rather than competitive exclusion. Governments that recognize this shift will not only foster healthier telecom markets but also unlock the full economic potential of the connected age.

Spectrum auctions, once considered the most efficient and transparent method to allocate public airwaves, are increasingly being criticized as counter-productive for 5G development. This two-page article explains why traditional auction-based policies no longer serve today's digital connectivity objectives and outlines alternative models better suited to current technological and market realities.

When first introduced, spectrum auctions were hailed as a solution to opaque spectrum assignment process. By letting market forces determine spectrum prices, governments ensured transparency and revenue maximization. However, as 5G networks demand massive bandwidth, dense deployment, and inclusive rural coverage, high-cost auctions now act as a bottleneck rather than a policy success.

In the latest 2024 5G spectrum auction, less than 1.34% of available spectrum was sold, generating only ₹11,340 crore compared to ₹150,000 crores in 2022 — a striking sign of diminishing enthusiasm among telecom operators. Mobile Operators having already paid heavily in previous rounds, now face financial fatigue while still struggling

to monetize their 5G infrastructure. Expensive auctions not only erode operator profitability but also reduce funds available for network rollouts, slowing digital transformation in semi-urban and rural areas. Globally, regulators face similar setbacks. The U.S. Federal Communications Commission (FCC)'s authority to auction spectrum lapsed in 2023, reflecting political and industry consensus that the old auction paradigm cannot cope with a scarcity of new, clean frequency bands. Many experts now argue that auctions are too rigid, slow, and ill-suited for an ecosystem where innovation requires flexible and shared access.

The Economic Burden of High Spectrum Prices

Today, many economists and industry analysts argue that spectrum auctions are not only economically inefficient but also stifle the very growth they were meant to enable. As nations look ahead to 6G and beyond, the auction model appears to be losing relevance, giving way to more collaborative and dynamic approaches to spectrum management.

One of the most critical problems with spectrum auctions is the astronomical prices they generate. Governments, eager to maximize short-term revenue, often push operators into bidding wars that drive costs to unsustainable levels. For example, in countries such as Germany and Italy, telecom companies spent tens of billions of euros on 5G spectrum alone.

These massive outlays leave operators heavily indebted before they even begin building networks. As a result, they have less capital available for actual infrastructure investment — the towers, fiber links, and base stations that bring 5G coverage to consumers. This paradox means that while governments enjoy short-term windfalls, the broader economy suffers from slower digital rollout, higher consumer prices, and reduced competition.

Moreover, when spectrum costs are passed on to consumers, they manifest as higher service prices or throttled innovation. Smaller and newer operators, unable to afford the steep auction prices, are often squeezed out, leading to greater market concentration and less competition. In the long term, the economy loses the dynamism that a competitive telecom sector can generate.

Auctions Favor Wealth Over Innovation

5G deployment relies on extensive low-, mid-, and high-band frequencies across dense small-cell networks — dramatically raising capital costs. Traditional auctions force telcos to pay high upfront fees for exclusive, long-term licenses, which limits cash flow for infrastructure expansion and innovation. Spectrum auctions inherently favour incumbents with deep pockets. Large operators can afford to spend billions on licenses, while startups or smaller regional carriers cannot. This dynamic entrenches existing monopolies or oligopolies and limits new entrants who might offer innovative services or business models. In India, this structure has effectively discouraged new entrants.

Spectrum auctions tend to reward dominant incumbents, not efficient spectrum use. When prices are set through aggressive bidding, smaller firms either exit or lease spectrum from larger operators at inflated rates. As noted by policy experts, the auction model is now **stifling competition**, contradicting the original intent of promoting fair allocation.

The fiscal argument often cited for auctions—high government revenue—is also losing relevance. With payments typically spread over 20 years, budgetary inflows are delayed and uncertain. Simultaneously, delayed network deployment slows GDP growth, offsetting short-term revenue gains.

This imbalance is particularly problematic in developing economies, where governments often adopt auction models designed in wealthier nations. These markets typically have fewer large telecom firms and less access to cheap financing, making it even harder for smaller operators to compete. The result is a cycle where a few dominant players control the market, limiting competition and keeping prices high for consumers.

Instead of fostering innovation and efficient spectrum use, auctions can therefore create barriers to entry — the opposite of what free-market proponents claim they achieve. In contrast, collaborative or shared spectrum models allow more players to participate, driving innovation in wireless technologies and applications.

The Distortion of Public Policy Goals

Another major criticism is that spectrum auctions distort public policy objectives. Ideally, spectrum allocation should balance economic efficiency with social welfare — connecting rural areas, supporting public safety, and enabling technological progress. However, when auctions prioritize revenue maximization, these broader goals are often sidelined.

Governments under fiscal pressure may see spectrum sales as easy cash injections, especially during times of economic stress. But this focus on short-term gain overlooks the long-term economic benefits of widespread, affordable connectivity. A well-connected society boosts productivity, supports digital education, and fosters new industries. When telecom firms are overburdened by spectrum debt, they often cut back on investment in rural areas or delay the rollout of next-generation networks, undermining these broader goals.

In some cases, the government ends up reinvesting its auction proceeds into digital infrastructure subsidies — essentially paying back what was taken from the same ecosystem in the first place. This circular inefficiency underscores the economic flaws in the current system.

Global Rethinking: Lessons from the 5G Rollout

The experience of 5G rollouts worldwide has underscored the weaknesses of spectrum auctions. In many regions, the high costs associated with auctions delayed

deployment, as operators struggled to justify massive capital expenditures amid uncertain returns. Meanwhile, in markets where spectrum was allocated at lower cost or through shared access, 5G networks were deployed more quickly and broadly.
This pattern suggests that lower-cost, more collaborative spectrum policies can accelerate innovation and economic growth. As we look ahead to the next generation of connectivity — 6G, the Internet of Things (IoT), and ubiquitous AI-driven networks — flexibility and affordability will be key. Spectrum policies must evolve accordingly, prioritizing long-term societal benefit over short-term fiscal gain.

Conclusion: The End of the Auction Era

Spectrum auctions once represented an elegant intersection of market economics and public policy. But in the age of 5G and beyond, their limitations have become impossible to ignore. They impose excessive financial burdens on operators, hinder competition, distort policy priorities, and slow innovation. it is time to move beyond legacy approaches. Experts recommend fixed-entry fees coupled with revenue sharing methodologies, ensuring both affordability and accountability. Policymakers can also reset the auction prices by setting a zero-based reserve price Moreover, India must recognize spectrum as an instrument of industrial growth — not merely a fiscal asset. Overpricing delays deployment, hurts consumer affordability, and undermines national digital inclusion goals. A more pragmatic model would combine direct assignment for strategic sectors, technology-neutral sharing for enterprise use, and low-cost licensing to encourage competition.

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Attachment 2

IAFI detailed comments on TRAI Consultation Paper on Auction of Radio Frequency Spectrum in the Frequency Bands Identified for International Mobile Telecommunications (IMT)

Date of issue: 30-09-2025 **Last date of submission: 28-10-2025**

Executive Summary

IAFI recognizes that the traditional **spectrum auction model**—long celebrated as a transparent and efficient way to allocate public airwaves—is increasingly becoming obsolete in the 5G era. Once a hallmark of market-based policy, current auction methodology acts as a **barrier to innovation, competition, and equitable digital growth**. As telecom networks expand and require vast, flexible, and affordable spectrum access, high auction costs have become a financial burden on operators. In India, for instance, spectrum sales and revenue have sharply declined, reflecting industry fatigue after years of heavy investment. For example, the latest **2024 5G spectrum auctions, less than 1.34% of available spectrum** was sold, **generating only ₹11,340 crore compared to ₹150,000 crores** in 2022 — a striking sign of diminishing enthusiasm among telecom operators. Similar trends are evident globally, where even the U.S. Federal Communications Commission has been signaling a broader rethink of how spectrum should be managed. Economists now argue that auctions distort priorities—rewarding wealth over innovation, restricting new entrants, and In our view, the **era of auctions is ending**. Therefore, TRAI must rethink the current auction model. **High Reserve prices** hinder digital inclusion and rural coverage while reducing funds for network rollout. Instead, policies should treat spectrum as a **public enabler of growth**, not a short-term fiscal asset. Recommended reforms include **Zero reserve price,** use-based payments based on

revenue sharing models, and direct assignment for private, captive and strategic uses. By prioritizing efficient use and open access over revenue maximization, TRAI can accelerate connectivity, foster competition, and prepare for the 6G and IoT future—where flexibility, affordability, and innovation matter more than who can pay the most.

In this context, IAFI is pleased to forward the detailed comments and suggestions on issues raised in the Consultation Paper. Our submission provides a point-by-point response to the specific questions posed, focusing on key areas such as:

a. Reserve price may be aligned with the current demand and market valuation. Current design flaw is due to the High, Static Reserve Prices, which often act as a ceiling rather than a floor, leading to massive unsold inventory. We Recommend ZERO reserve price for all frequency bands
b. We recommend to move away from the current Simultaneous Multiple Round Auction (SMRA) to a more modern, package-centric format like the Combinatorial Clock Auction (CCA), complemented by procedural reforms.
c. IAFI strongly supports the inclusion of the **600 MHz band (612–652 MHz / 663–703 MHz) in this round**, aligned with the **APT 600 MHz Band Plan (3GPP Band n105)**, as ecosystem challenges that kept it unsold in 2022—such as limited standardization and device readiness—have now been resolved through global progress. The band has gained momentum, with adoption in countries like **Saudi Arabia, UAE, New Zealand, Vietnam, and India**, backed by international coordination through the **ITU and 3GPP**. Its inclusion in 3GPP standards has driven widespread **chipset and device support** from vendors such as Qualcomm, enabling rapid commercial rollout. Offering **excellent propagation characteristics**, the n105 band provides a cost-effective solution for expanding **nationwide 5G coverage**, improving rural connectivity, and enhancing in-building penetration in urban areas. Given its harmonized, FDD-based 40 MHz paired structure, already endorsed by **TRAI** and globally standardized, APT 600 MHz (n105) represents the optimal choice for **efficient and inclusive spectrum utilization** across the Asia-Pacific region.
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auction. This band is critical for India's 6G vision, and its allocation needs to be linked to the future 7 -8 GHz spectrum likely to be allocated for 6G at WRC-27. **The combined 6425-8400 MHz spectrum band is likely to provide up to 4 contiguous Blocks of 400 MHz** each to meet the future needs ultra broadband connectivity upto 4 Mobile operators. Therefor the planning of the 6 GHz auction needs to consider future 400 MHz contiguous blocks.

(i) India is at a critical crossroads in shaping its 6G future, and the Upper 6 GHz band (6425–6725 MHz and 7025–7125 MHz) is seen as a vital asset in this journey. The recommendation is to reserve this spectrum for International Mobile Telecommunications (IMT) and delay any auction until after the World Radiocommunication Conference 2027 (WRC-27). This would allow India to align with global harmonization efforts and explore the potential of a contiguous spectrum extending into the 7–8 GHz range. Premature auctioning could lead to misalignment with international standards, resulting in fragmentation, interference, and higher costs for equipment and deployment.

(ii) The 6425–7125 MHz band is considered greenfield spectrum, largely free from legacy systems, so making it ideal for 6G, which demands clean, high-capacity, and low-latency frequencies. Auctioning this band for current technologies like 5G could lead to inefficient use and costly refarming in the future. Furthermore, 6G is expected to require 200–400 MHz of mid-band spectrum per operator, and the Upper 6 GHz and adjacent bands offer a unique opportunity to meet this demand. Reserving this spectrum ensures that operators have access to the necessary resources for delivering world-class 6G services.

(iii) Aligning with the Prime Minister's vision for India as a global 6G leader, the Bharat 6G Vision Document and the Bharat 6G Alliance (B6GA) emphasize the importance of this "golden band" for future innovation. Preserving it supports indigenous development, global collaboration, and leadership in setting international standards. Delaying the auction until after WRC-27 not only aligns with global trends, mirroring the approaches of countries like China and Brazil—but also reinforces India's

strategic and economic interests. The recommendation is clear: earmark the entire Upper 6 GHz band for IMT and revisit its allocation post-WRC-27 to ensure long-term national and global benefits.

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Our answers to specific Questions are given below:

Q-1. What measures should be taken to enhance competition and mitigate over-supply of the spectrum in various frequency bands in the forthcoming auction? Please provide a detailed response with justifications.

IAFI Response:

1. In April 2022, TRAI provided recommendations to DoT for the auction of spectrum across multiple bands for IMT/5G, including new bands like 600 MHz, 3300 MHz, and 26 GHz. Key recommendations include auctioning all available spectrum, adopting the APT 600 Band Plan, and setting various spectrum caps and network deployment-based roll-out conditions. In July/August 2022 auction, total 71% (51,236 MHz) of the spectrum was sold, raising ₹1,50,173 crore.
2. In September 2023, TRAI again recommended and reiterated its previous reserve price recommendations for existing bands for auction of spectrum. The June 2024 auction saw a limited sale, with only 141.40 MHz of spectrum sold out of 10,522.35 MHz, for ₹11,340.79 crore, and no bids was received in the 800 MHz, 2300 MHz, 3300 MHz, and 26 GHz bands.
3. DoT vide reference dated May 15, 2025 requested TRAI for fresh recommendations for the auction of existing bands (800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, 26 GHz) and to explore the auction possibilities for the newly identified 6425-6725 MHz and 7025-7125 MHz ranges. DoT also pointed out regarding significant available spectrum, remained unsold in the 2024 auction, expiring licenses, and re-farming efforts, as well as a request from Indian Railways.

So, to enhance competition and mitigate the over-supply of spectrum, as evidenced by the low sales in the June 2024 auction, following measures could be taken.

a. Reserve price may be aligned with the current demand and market valuation. Lowering the reserve price, especially for bands with zero demand, would increase the likelihood of bids and generate competition among bidders.

b. Putting the entire available and unsold quantum to auction again may risks repeating the over-supply problem. TRAI should consider auctioning a lower, optimized quantum in bands with zero or low demand to create a more realistic quantum. It may achieve an optimal supply-demand balance**,** stimulating competition among a few interested bidders and fetching a better price for the offered block.
c. Delaying the auction of 6 GHz bands with an underdeveloped ecosystem, until global or domestic equipment development gets mature, to mitigates over-supply of unusable-spectrum and improves the chance of competition in a future auction.
d. More flexible or staggered payment terms and realistic rollout obligations for specific bands should be allowed, to lower the entry barrier and enhance bidder participation and competition.
e. Existing Block size and minimum bid quantities are restricting participation and preventing large operators from bidding for more spectrum, from acquiring contiguous blocks needed for efficient 5G rollout. These parameters should be re-examined to ensure competition.

Q-2. Whether the entire available spectrum in the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz band should be put to auction in the forthcoming auction?

(a) If yes, what measures should be taken to ensure effective competition in the forthcoming auction?

(b) If no, what quantum of spectrum in each of the frequency bands should be put to auction in the forthcoming auction?

Kindly provide a detailed response with justifications.

IAFI Response:

Considering massive unsold inventory put to auction in 2024 and Zero Demand in four key bands (800 MHz, 2300 MHz, 3300 MHz, and 26 GHz), the entire available spectrum in the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500

MHz, 3300 MHz, and 26 GHz band should not be put to auction in the forthcoming auction. Auctioning a lower quantum/volume of spectrum, may create a better supply-demand balance and the market at potentially revised/lower reserve prices. Similarly, the ecosystem for 6 GHz band is still in the developing stage, so auction for this bands should be re-examined and fresh timing may be explored.

Q-3. Whether the band plans, which have been adopted for the existing bands viz. the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz bands in India, should be retained in the forthcoming auction? If no, kindly suggest new band plan(s) for the existing bands with detailed justifications.

IAFI Response:

Yes, the band plans already adopted for the existing bands (800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz) should be retained in the forthcoming auction, ensuring coexistence and minimizing interference, global harmonization and avoiding regulatory uncertainty.

Q-4. Whether the spectrum in the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz bands should be auctioned on Telecom Circle/ Metro Area basis with a validity period of 20 years in the forthcoming auction? If no, what should be the area, and validity period of spectrum assignment in the existing bands? Please provide detailed response with justifications.

IAFI Response:

Yes, the spectrum in the existing bands should be auctioned on the current basis of Telecom Circle/ Metro Area with a validity period of 20 years in the forthcoming auction, to ensure the newly assigned spectrum aligns with the geographical validity of the TSPs' Unified Licenses, maintaining consistency with a standard practice adopted in India and promoting long-term investment.

Q-5. Whether the block size and minimum quantity for bidding in the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz bands should be kept the same in the forthcoming auction as those in the spectrum auction of June 2024 as mentioned in Table No. 2.14 of this consultation paper? If not, what should be the band-wise block size and minimum bid quantity? Kindly provide a detailed response with justifications.

IAFI Response:

The block size and minimum bid quantity for spectrum in the existing bands should be largely retained in the forthcoming auction to maintain technical consistency and global harmonization, but the minimum bid quantities for the unsold bands (800 MHz, 2300 MHz, 3300 MHz, 26 GHz) should be re-evaluated for commercial flexibility.

The main reason for the lack of bids in the June 2024 auction was the high reserve price and excessive quantum offered for auction, not the block size itself. However, minor adjustments to minimum bid quantities can help stimulate demand and meet the directive to enhance competition.

Main reason for retaining the block size in frequency bands 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz and 26 GHz are as follows.

1. For 900/1800 MHz band - Small block size of 0.20 MHz is suitable for existing FDD-based networks and allow TSPs to acquire small amounts to top-up holdings without massive investment.
2. For 2100 MHz - Block-size 5x5 MHz is the global standard minimum channel bandwidth for efficient 3G/4G/5G FDD deployments.
3. For 2300, 2500 and 300 MHz – Block-size 10 MHz block is the fundamental, globally harmonized unit for efficient TDD operation in mid-band 4G and 5G.
4. For 26 GHz – Block-size 50 MHz is essential for high-throughput 5G millimeter wave (mm-Wave) service.

Suggestions:

1. For 2300 MHz - Block-size should be reduced to 5 MHz from existing 10 MHz, allows operators to bid for smaller, more affordable chunks and gives maximum flexibility to those who already have fragmented holdings (e.g., 20+5 MHz) to reach an efficient block (e.g., a contiguous 30 MHz).

So, for bands where demand is already present (900 MHz, 1800 MHz, 2100 MHz), the current parameters should be retained for stability. For the bands that went entirely unsold (800 MHz, 2300 MHz, 3300 MHz, 26 GHz), a review of the minimum bid quantity is critical to lower the barrier.

Q-6. What should be the eligibility criteria and associated eligibility conditions for participation in the forthcoming auction for the existing bands viz. the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz bands? Kindly provide a detailed response with justifications.

IAFI Response:

The eligibility criteria and associated conditions for the forthcoming auction of existing IMT bands (800 MHz to 26 GHz) should continue, but Net Worth condition and eligibility to non-Access Service Providers like ISPs, must be re-defined.

For the 26 GHz (mm-Wave) band, eligibility should be expanded to include ISPs and M2M service providers. This is consistent with TRAI's earlier recommendations for the 37-40 GHz band, as the mm-Wave spectrum's prime use is for the Fixed Wireless Access (FWA) and high-capacity services. Allowing ISPs, especially ISPs (Category A/B) and M2M Service Providers (Category A/B), will accelerate broadband penetration and increase competition in the fixed line segment, utilizing the available vast spectrum (over 45,000 MHz was unsold in 2022 and zero bids in 2024).

Similarly, the Net Worth requirement of ₹100 Crore per LSA (₹50 Crore for J&K and NE) for "New Entrants" should be deleted or significantly lowered/modified for the forthcoming auction.

Q-7. Whether there is a need for modifying roll-out obligations for the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz and 26 GHz bands, as stipulated in the Notice Inviting Application (NIA) for the spectrum auction held in June 2024 in order to improve mobile coverage in the country? If yes, what modifications should be made in the roll-out obligations for the existing bands? Kindly provide a detailed response with justifications.

IAFI Response:

The current system for sub-6 GHz bands (800 MHz to 2500 MHz) is outdated, as most operators have already fulfilled their initial "coverage-based" obligations using any technology in any band, allows operators to acquire new spectrum in these bands without facing any additional deployment mandate, directly leading to persistent coverage gaps (dead zones) on highways, train routes, and in remote areas, as highlighted by TRAI's drive tests. Roll-out obligations should be band-specific for the acquired spectrum, to ensure the new airwaves are deployed to improve the network.

All service providers should be mandated with a minimum percentage (e.g., 5%) of the newly installed sites (for 3300/26 GHz) or an equivalent measure (for 800-2500 MHz) to be deployed in rural SDCAs that currently lack any 4G/5G service, to ensure that newly acquired capacity and coverage is directed towards underserved rural and remote areas, promoting digital inclusion.

Q-8. Whether there is a need to review the spectrum caps for the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz and 26 GHz bands for the forthcoming auction? If yes, what should be the spectrum cap per service provider for different frequency bands? Kindly provide a detailed response with justifications.

IAFI Response:

IAFI is of the view that there is no immediate need to review or change the existing 40% spectrum caps (as used in the June 2024 auction) for the forthcoming auction of existing bands (800 MHz to 26 GHz). The 40% cap is a reasonable level that prevents any single operator from monopolizing the crucial spectrum resources in any grouping (Sub-1 GHz, Mid-Band, etc). The current cap structure is designed to promote competition by preventing large holdings and aligning with global practices.

Q- 9. Are there any other inputs/ issues related to the auction of spectrum in the existing bands viz. 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz and 26 GHz bands for the forthcoming auction? Suggestions may be made with detailed justifications.

IAFI Response:

IAFI suggest the following.

1. The eligibility for the 26 GHz band should be expanded to include Internet Service Providers (ISPs) and M2M Service Providers. This must be accompanied by a clear regulatory pathway allowing spectrum sharing and leasing for these non-mobile service providers from the date of assignment. As the primary use case for 26 GHz is Fixed Wireless Access (FWA) and high-capacity hot-spots, enabling sharing will further enhance the spectrum use.
2. The Government has decided to hold spectrum auctions in the last quarter of every financial year. This commitment must be strictly adhered to and publicized. A predictable auction calendar reduces speculative behavior by TSPs, allows them to plan their CAPEX requirements accurately, and ensures the continuous availability of spectrum, ultimately stabilizing the market and

promoting efficiency.

Q- 10. Whether the spectrum in the 600 MHz band should be put to auction in the forthcoming auction? If yes, whether the band plan n105 should be adopted for the 600 MHz band, or otherwise? Please provide a detailed response with justifications.

IAFI Response:

Yes. IAFI fully support for the auction of the 600 MHz band (663-703 MHz/ 612-652 MHz (Reverse Duplex)), Band Plan APT 600 MHz, now known as 3GPP Band n105. The main reasons for the band remained unsold in 2022, was due to the nascent ecosystem, lack of global identification/ standardization) and now these issues have largely been addressed by recent international developments. The APT600 MHz band plan has been studied extensively and is tailored to meet the needs of the APT region, offering a harmonized approach to spectrum utilization that supports Frequency Division Duplex (FDD) with reverse duplexer configuration.

Several countries—including India, New Zealand, Vietnam, and parts of Latin America—have shown strong interest in adopting the n105 band. Countries like Saudi Arabia and the UAE have adopted the band in 2024, indicating accelerating global market momentum. While global adoption remains uneven due to legacy regional plans and varying regulatory environments, the momentum toward harmonization is growing. Regional coordination efforts, supported by organizations like the ITU and 3GPP, are helping to streamline policy frameworks and encourage broader uptake of the APT600 MHz band plan. For emerging markets, n105 offers a realistic and cost-effective path to achieving nationwide 5G coverage, especially in areas where mid-band or high-band spectrum is impractical due to propagation limitations or infrastructure costs.

One of the most compelling arguments for adopting the n105 band is the readiness of the chipset ecosystem. Inclusion of APT600 MHz in the 3GPP NR channel list has simplified integration for handset manufacturers, fixed wireless access (FWA)

providers, and IoT device makers due to readily available support in chipsets. Major chipset vendors like Qualcomm have already incorporated n105 support across their product lines, including RFICs for smartphones, customer-premises equipment (CPE), and FWA platforms. This was showcased during IMC-2024, where commercial devices demonstrated seamless operation on n105. As telecom operators procure this band, original device manufacturers (ODMs) and original equipment manufacturers (OEMs) are expected to enable n105 support across their new devices, including budget-friendly models.

Device support for newer bands is very closely related to regulatory clarity. Having unambiguous and clear regulatory decision motivates the device vendors to start offering the band within the cost-sensitive markets like India. This mirrors the successful rollout of Band n78 and n28 in India post-2022 auction, where ODMs quickly adapted to market needs. These bands n78, n28 among others followed a similar playbook, they were already supported in the chipset, and device makers rapidly enabled these bands to cater to market trends. The support for n105 is expected to follow a similar trend, with a robust and ready support in chipset, and devices to closely follow market trends based on business considerations in cost sensitive markets like India.

The band offers significant public benefit due to its excellent propagation characteristics, which can effectively enhance terrestrial mobile coverage in rural and remote areas and fill in-building coverage gaps in urban areas also. Additionally, low-band spectrum supports efficient spectral reuse and reduces the need for dense infrastructure, lowering deployment costs and accelerating time-to-market for operators.

APT 600 MHz (n105) FDD, 40 MHz (paired), [663-703 MHz (UL), 612-652 MHz (DL)] should be adopted to maximized spectrum use, as utilizes 40 MHz paired spectrum. It aligns with the TRAI previously recommended plan and same has been globally standardized by 3GPP (n105). This is the preferred option in the Region 3 area (Asia Pacific).

Q-11. In case you are of the opinion that the 600 MHz band should not be put to auction in the forthcoming auction, what should be the timelines for auctioning of the 600 MHz band? Please provide a detailed response with justifications.

IAFI Response:

While the band remained unsold in 2022, due to the lack of bids influenced by high reserve prices and overall market uncertainty at that time. With the technical ecosystem now maturing, offering the band again at a potentially lower reserve price, is justified to promote coverage expansion.

To maximize the benefits of n105, it is recommended that national regulatory authorities auction the entire 600 MHz band in alignment with the APT600 MHz plan. This will ensure spectrum harmonization, simplify equipment certification, and foster a robust device ecosystem. Governments should also engage in regional coordination to align spectrum policies and avoid fragmentation. Furthermore, spectrum planning should consider future scalability, allowing for seamless upgrades to support advanced 5G use cases such as remote healthcare, autonomous transport, and industrial IoT.

Q-12. In case it is decided to auction the spectrum in the 600 MHz band in the forthcoming auction, -Should the entire available spectrum in the 600 MHz band be put for bidding in the forthcoming auction?
Whether the eligibility criteria, associated eligibility conditions, block size, minimum bid quantity of spectrum, validity period for the assignment of spectrum, area of assignment on Telecom Circle/ Metro Area-basis, spectrum cap and roll out obligations for the spectrum in the 600 MHz band in the forthcoming auction should be kept the same as those in the spectrum auction of 2022, or otherwise?
Please provide a detailed response with justifications.

IAFI Response:

IAFI suggest that the entire 600 MHz band (612-652 MHz / 663-703 MHz) should be put to auction in the forthcoming auction, and definitively adopt the APT 600 MHz Band Plan, now known as 3GPP Band n105. The 600 MHz band is a prime band (2x40 MHz, APT 600/n105) with exceptional propagation and in-building penetration characteristics. The purpose of auctioning this band is to enhance mobile coverage, particularly in rural and far-flung areas. Offering the full 2x40 MHz ensures that the entire capacity can be acquired and utilized for this critical national objective.

Block Size - 2x5 MHz block size offers the maximum granularity and flexibility for bidders, allowing operators to acquire capacity in smaller, more affordable chunks, thereby lowering the initial investment for a new, large block of spectrum.

Eligibility Conditions (like Net Worth) should be significantly lowered. The existing requirement for New Entrants (₹100 Crore/LSA) acts as a high barrier. To encourage new participation in a band that previously received zero bids, this financial requirement must be deleted or at least significantly lowered to promote new entrants and competition.

Similarly, regarding Roll-out Obligations should be Band-Specific and Coverage-Based, to ensure the spectrum is utilized for its intended purpose, especially rural and in-building coverage. The time period for meeting in Metro LSAs should be enhanced to 2 years (40% coverage by Year 1, 90% by Year 2), aligning with the proposal for other low bands.

Q-13. Are there any other inputs/ issues related to the auction of spectrum in the 600 MHz band for the forthcoming auction? Suggestions may be made with detailed justifications.

IAFI Response:

3GPP completed its Technical Report TR 38.8922 "APT 600 MHz NR band" in April 2023. And following that, the 3GPP has fully completed all of the standardization work related to band n105 (i.e., APT 600 MHz Band)". Further, 3GPP, while fully realizing

[2] https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=4123

that the true ecosystem development may require all necessary band combinations that are relevant for Asia Pacific and particularly India, the 3GPP RAN4 group has been consistently working towards adding several band combinations from 2CC to 6CC that include the n105 along with the frequency bands that are typically used for IMT in Region 3 (including those in India).

In conclusion, the 600 MHz band, when aligned with the 3GPP n105 plan, offers a transformative opportunity for expanding inclusive, resilient, and cost-effective 5G networks. Its adoption will not only enhance connectivity but also catalyze innovation across sectors, making it a cornerstone of digital infrastructure for the next decade.

Q-14. Whether the spectrum in 6425-6725 MHz and 7025-7125 MHz ranges in the upper 6 GHz band should be put to auction for IMT in the forthcoming auction? Kindly provide a detailed response with justifications.

IAFI Response:

IAFI fully supports the timely auction of upper 6GHz band for IMT. This band is critical for India's 6G vision, and its allocation needs to be linked to the future 7 -8 GHz spectrum likely to be allocated for 6G at WRC-27. **The combined 6425-8400 MHz spectrum band is likely to provide up to 4 contiguous Blocks of 400 MHz** each to meet the future needs ultra broadband connectivity by upto 4 Mobile operators. Therefor the planning of the 6 GHz auction needs to consider future 400 MHz contiguous blocks.

Q-15. In case you are of the opinion that the spectrum in 6425-6725 MHz and 7025-7125 MHz ranges should not be put to auction in the forthcoming auction, what should be the timelines for auctioning of this spectrum for IMT? Kindly provide a detailed response with justifications.

IAFI Response: See our reply to Q17 Below

Q-16. Considering that the satellite-based service (uplink) will coexist with IMT-based services in the upper 6 GHz band, - whether pilot trials should be conducted to ascertain the keep- out distance of the IMT base stations for satellite uplink stations before the auction of the upper 6 GHz band,
or
should it be left to the telecom service providers to ascertain the keep-out distance of the IMT base stations for satellite uplink stations at the time of commercial deployment after the auction?
Kindly provide a detailed response with justifications.

IAFI Response:
There are ITU Recommendations and Result of WRC-23 that guides the separation distances and these are well documented in the results of ITU studies leading to WRC-27. We recommend that WPC should FULLY implement the decisions of WRC-23 in this regard.

Q-17. In case it is decided to put the spectrum in 6425-6725 MHz and 7025-7125 MHz ranges in the forthcoming auction,

- **Whether the 3GPP band plan n104 should be adopted for the upper 6 GHz band? If no, which band plan should be adopted for the upper 6 GHz band?**
- **What amount of spectrum in the 6425-6725 MHz and 7025-7125 MHz ranges should be put to auction?**
- **Whether the spectrum in the 6425-6725 MHz and 7025- 7125 MHz ranges should be auctioned on Telecom Circle/ Metro service area basis with a validity period of 20 years? If no, what should be the area and validity period of spectrum assignment in the 6425-6725 MHz and 7025- 7125 MHz ranges?**
- **What should be the block size, minimum bid quantity, and roll-out obligations for the spectrum in these ranges?**
- **What should be the eligibility criteria and associated eligibility conditions for bidding for the spectrum in these ranges?**
- **Please provide a detailed response with justifications.**

IAFI Response: The allocation of 6GHz needs to be linked to the future 7 -8 GHz spectrum likely to be allocated for 6G at WRC-27. The combined 6425-8400 MHz spectrum band is likely to provide up to 4 contiguous Blocks of 400 MHz each to meet the future needs ultra broadband connectivity by upto 4 Mobile operators. Therefor the planning of the 6 GHz auction needs to consider future 400 MHz contiguous blocks. India is at a critical crossroads in shaping its 6G future, and the Upper 6 GHz band (6425–6725 MHz and 7025–7125 MHz) is seen as a vital asset in this journey. The recommendation is to reserve this spectrum for International Mobile Telecommunications (IMT) and delay any auction until after the World Radiocommunication Conference 2027 (WRC-27). This would allow India to align with global harmonization efforts and explore the potential of a contiguous spectrum extending into the 7–8 GHz range. Premature auctioning could lead to misalignment with international standards, resulting in fragmentation, interference, and higher costs for equipment and deployment.

The 6425–7125 MHz band is considered greenfield spectrum, largely free from legacy systems, so making it ideal for 6G, which demands clean, high-capacity, and low-latency frequencies. Auctioning this band for current technologies like 5G could lead to inefficient use and costly refarming in the future. Furthermore, 6G is expected to require 200 – 400 MHz of mid-band spectrum per operator, and the Upper 6 GHz and adjacent bands offer a unique opportunity to meet this demand. Reserving this spectrum ensures that operators have access to the necessary resources for delivering world-class 6G services.

Aligning with the Prime Minister's vision for India as a global 6G leader, the Bharat 6G Vision Document and the Bharat 6G Alliance (B6GA) emphasize the importance of this "golden band" for future innovation. Preserving it supports indigenous development, global collaboration, and leadership in setting international standards. Delaying the auction until after WRC-27 not only aligns with global trends, mirroring the approaches of countries like China and Brazil—but also reinforces India's strategic and economic interests. The recommendation is clear: Earmark the entire

Upper 6 GHz band for IMT and revisit its allocation post-WRC-27 to ensure long-term national and global benefits.

Q-18. What provisions with respect to the spectrum cap per service provider in a licensed service area (LSA) should be made applicable for the spectrum in the upper 6 GHz band for IMT? Specifically, -

- **Whether a combined spectrum cap for the 3300 MHz band and the upper 6 GHz band should be prescribed? If yes, what should be the spectrum cap per service provider?**
- **In case your response to (a) above is in the negative, what should be the spectrum cap per service provider for the spectrum in the upper 6 GHz band?**
- **Please provide a detailed response with justifications.**

IAFI Response:

Please see our response to Q-14 to Q-17.

Q-19. To mitigate inter-operator interference due to TDD-based configuration, whether the approach adopted for the 3300 MHz and 26 GHz bands should also be made applicable for the newly identified spectrum in the upper 6 GHz band? In case you are of the opinion that some other provisions are required to be established, suggestions may kindly be made with detailed justifications.

IAFI Response:

Please see our response to Q-14 to Q-17.

Q-20. Are there any other inputs/ issues related to the auction of spectrum in the upper 6 GHz band for the forthcoming auction? Suggestions may be made with detailed justifications.

IAFI Response:

Please see our response to Q-14 to Q-17.

Q-21. Considering the need to assign a contiguous 24 MHz block in the 1427-1518 MHz range to the Government user,

(a) Which band plan and duplexing scheme should be adopted for IMT in the 1427-1518 MHz range?

(b) Which range of spectrum (a contiguous block of 24 MHz) should be assigned to the Government user?

Kindly provide a detailed response with justifications.

IAFI Response:

The spectrum in the 1427-1518 MHz range, total- 91 MHz, of which 67 MHz is identified for commercial IMT and a continuous 24 MHz block is required for the Government user. This Band offers superior propagation characteristics compared to higher frequency bands like 3.5 GHz and 6 GHz, making it ideal for Supplemental Uplink (SUL) in 5G networks. Lower frequencies experience less free-space path loss, allowing signals from low-power user devices to travel farther and penetrate obstacles like buildings and foliage more effectively. This ensures reliable connectivity, especially in urban and suburban environments. Unlike downlink transmissions, which benefit from high-power base stations and massive MIMO, uplink transmissions are constrained by device limitations such as battery life and hardware. These constraints make higher frequencies less effective for uplink, leading to signal degradation and reduced range. By shifting uplink traffic to the L Band, operators can maintain robust connectivity even at cell edges, improving overall network performance and user experience.

Evolving Uplink Demand in Telecom Networks

Telecom networks are undergoing a paradigm shift due to rising uplink traffic. Historically focused on downlink for streaming and browsing, networks now face surging demand for uploads driven by video calls, live streaming, cloud gaming, IoT, and remote work. Modern devices continuously transmit data to the cloud, necessitating low-latency and high-efficiency uplink channels. Technologies like 5G, edge computing, and massive MIMO are being deployed to support symmetrical data flows. This shift is critical for emerging applications such as virtual reality,

telemedicine, autonomous vehicles, and industrial IoT, which rely on real-time, two-way communication. As users increasingly generate and share content, the traditional download-centric model is obsolete. Strengthening uplink capacity is essential to meet the demands of a hyperconnected world and ensure seamless digital experiences.

Q-22. Are there any other inputs/ issues related to the spectrum in the 1427-1518 MHz range? Suggestions may be made with detailed justifications.

IAFI Response:

Network Efficiency and Economic Viability of L Band SUL

Deploying SUL in the L Band enhances spectral efficiency and reduces interference due to its wide coverage and better resource reuse. Fewer base stations are needed, simplifying network planning. The L Band complements mid-band downlink carriers, enabling high downlink throughput while maintaining strong uplink channels. This dual-band strategy balances performance in asymmetric networks, especially for data-heavy applications. Economically, the L Band is attractive because many regions already have allocated or underutilized spectrum, reducing acquisition costs. Its proximity to legacy LTE and sub-2 GHz bands ensures compatibility with existing antenna and RF technologies, lowering deployment expenses. These factors make the L Band a cost-effective and technically sound choice for improving uplink reliability and coverage in 5G networks.

Regulatory Considerations and Band Planning

a. Currently, there is no 3GPP-defined SUL band plan for the L Band, though discussions are underway.
b. ITU-R recommends three arrangements: SDL (G1), FDD (G2), and TDD (G3).
c. Existing 3GPP bands include FDD (Bands 11, 21, 74), SDL (Bands 32, 75, 76), and TDD (Bands 45, 50, 51).
d. However, a government decision to reserve 24 MHz of L Band spectrum limits usable bands for telecom. To facilitate SUL deployment, a contiguous 24 MHz block, preferably 1427–1451 MHz should be allocated to government use. This would streamline equipment design, ensure clean spectrum for operators, and

simplify future harmonization if the government relinquishes the spectrum. Authorities are advised to support L Band SUL adoption and await 3GPP outcomes to guide implementation.

Q-23. Whether there is a need to review the spectrum auction method and design followed in India? If yes, suggestions on spectrum auction method and design may be made with detailed justifications and international practice in this regard.

IAFI Response:

Yes, Please see Attachment 2 for our comments on the Auctions process.

The existing auction design, the Simultaneous Multiple Round Ascending (SMRA) auction, has proven inadequate in the current market environment, characterized by market consolidation and significant unsold spectrum (over 98% unsold in the June 2024 auction). The design, while effective in transparent price discovery during times of spectrum scarcity and high competition (pre-2016), has lost its efficacy as TSPs now bid strategically and selectively. The review must shift the focus from merely maximizing revenue to maximizing efficiency and spectrum utilization while maintaining transparency. Current design flaw is due to the High, Static Reserve Prices. Reserve prices often act as a ceiling rather than a floor, leading to massive unsold inventory (e.g., zero bids in 800 MHz, 2300 MHz, 3300 MHz, and 26 GHz in 2024).

IAFI suggest modification, to move from the current SMRA to a more modern, package-centric format like the Combinatorial Clock Auction (CCA), complemented by procedural reforms.

In SMRA, bidders bid on single, generic blocks in each of the 22 Licensed Service Areas (LSAs). The core flaw of SMRA is that it forces bidders to risk winning some but not all of the components needed for an efficient network (e.g., winning in Mumbai but losing in Delhi).

In the proposed CCA method, bidders bid on packages of spectrum blocks across multiple bands and/or LSAs simultaneously. CCA eliminates this "aggregation risk" by allowing bids for complementary packages (say 10 MHz in 2300 MHz across all four Metro LSAs). This ensures that spectrum goes to the operator who values it most for an integrated network.

CCA offers Reserve Price Reform & Flexibility, mechanism allows for dynamic adjustment based on auction outcomes, market conditions, and international benchmarks. IAFI suggest that TRAI should consider:

a) Lowering initial reserve prices across the board for all bands.

b) Utilizing the feature of CCA, to allow prices to fall if demand is low, before the auction concludes.

CCA is better suited to a consolidated market with few bidders and complex package valuations, which perfectly describes the current Indian telecom scene. CCA is a popular, modern format used successfully in the UK, Germany, and the Netherlands.

Q-24. What additional economic, technical, or market-related factors should be taken into account while determining the valuation and, subsequently, the reserve price of spectrum, in order to promote effective competition, ensure optimal spectrum utilization, and encourage wider participation in auctions?

IAFI Response:

The low sale rates in recent auctions, particularly the high quantum of unsold spectrum in June 2024, indicate that India's spectrum valuation methods must be expanded beyond simple indexing and benchmarking. The goal should shift from maximizing immediate revenue to maximizing long-term social and economic welfare through efficient spectrum utilization.

Q-25. Should the valuation of a given spectrum band, among 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2500 MHz, 3300 MHz, and 26 GHz, be based exclusively on its respective auction-determined price from the 2022 and/or 2024 auctions, without applying any other valuation approach? In such a case, should the auction price be indexed using MCLR or any other basis (please specify) to account for the time gap? Please provide detailed justification.

IAFI Response:

No, the valuation of a given spectrum band should not be based exclusively on its respective auction-determined price from the 2022 and/or 2024 auctions, even with indexing. Exclusively relying on past auction prices is quite inappropriate and risks repeating the failures of recent auctions, specifically the June 2024 auction, where over 98% of the offered spectrum went unsold and four major bands received zero bids. Main reason are:-

1. The valuation of spectrum is a function of real-time market conditions, which change rapidly due to consolidation (fewer bidders), technology evolution (5G adoption, 6G planning), and operator financial health. The price discovered in 2022 was for a market entering the 5G rollout phase; the price discovered in 2024 reflected a market saturated with excess spectrum and high reserve prices. A historical price, even when indexed, is merely a backward-looking estimate and does not capture current demand or competition levels.
2. In auctions with low participation (like 2024), the price discovered (which was often the reserve price) does not reflect the true market value. Using the unsold price as the base for the next auction would be illogical and lead to a perpetual cycle of unsold spectrum, directly contradicting the objective of efficient spectrum allocation. For the bands that received zero bids (800 MHz, 2300 MHz, 3300 MHz, 26 GHz), the "auction-determined price" is effectively zero, making it an unusable base.

3. While indexing (e.g., using MCLR or the Consumer Price Index (CPI)) can account for the time value of money, it fails to capture changes in market risk or technology value. The value of a capacity band (like 2500 MHz) can increase if usage grows exponentially, or decrease if a superior capacity band (like 6 GHz) becomes available.

Q-26. If the answer to the above is in the negative, should the past auction-determined price of the respective spectrum band still be considered as one of the approaches or basis for valuation, along with other approaches? Please provide justification for your response. In such a case, should the auction price be indexed using MCLR or any other basis (please specify) to account for the time gap? Please provide detailed justification.

IAFI Response:

Yes, the past auction-determined price of the respective spectrum band should still be considered as one of the approaches or bases for valuation, but strictly as a reference point alongside other comprehensive valuation methodologies. Using the past auction price as one of the input ensures transparency and continuity with regulatory precedent, it must be contextualized by current economic and technical realities.

Q-27. Should the spectrum valuation exercise be undertaken once every three years, as recommended by the Authority in its recommendations dated 11.04.2022? If not, what should be the revised periodicity for conducting the valuation exercise? Please justify your response along with detailed basis for conducting a fresh valuation exercise.

IAFI Response:

The TRAI previous recommendation dated 11.04.2022, to conduct a fresh spectrum valuation exercise once every three years is not appropriate in the current dynamic

market and should be revised to a more flexible model. A rigid, three-year cycle does not account for the rapid changes in technology, market structure, and unforeseen events that directly impact spectrum's commercial value. This annual check ensures the reserve price remains relevant and avoids a massive market disconnect.

The revised periodicity should be annual, before the planned auction in the last quarter of every financial yea, coinciding with the Government's commitment to hold auctions every fiscal year, with a comprehensive fresh valuation. An annual exercise de-risks the auction process and makes the predictable auction calendar.

Introduction of a new mobile generation (5G-Advanced, 6G), new globally harmonized bands (e.g., 6 GHz IMT), or major advancement in radio technology (e.g., Massive MIMO, Open-RAN) can drastically change a band's value. These shifts, which can occur at any time, must trigger an immediate valuation review. Similarly, full valuation is necessary following major events like- large-scale mergers or acquisitions that consolidate market share; the entry or exit of a major operator; or significant changes in the financial health of the sector.

Q-28. Should the valuation models as adopted by the Authority in its last recommendation, continue to be used as a basis for valuation of spectrum in the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, and 26 GHz bands?
Please provide a detailed justification.

IAFI Response:

No comments, as reply furnished from Q-23 to Q-27.

Q-29. Is there a need to introduce any changes to the valuation models or methodologies currently followed by the Authority for spectrum valuation exercises, including the discontinuation of any existing model or the introduction of a new model? If yes, please provide specific suggestions along with a detailed justification.

IAFI Response:

No comments, as reply furnished from Q-23 to Q-27.

Q-30. Should the auction determined price of other bands by using spectral efficiency factor serve as a basis of valuation for the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz and 26 GHz bands? If yes, which spectrum bands be related, what efficiency factor or formula should be used and what is the basis for the same? Please justify your suggestions.

IAFI Response:

No comments, as reply furnished from Q-23 to Q-27.

Q-31. Apart from the approaches highlighted above which other valuation approaches should be adopted for the valuation of spectrum in existing bands? Please provide detailed information along with justifications.

IAFI Response:

No comments, as reply furnished from Q-23 to Q-27.

Q-32. Should the auction determined price of other bands by using spectral efficiency factor serve as a basis of valuation for 6425– 6725 MHz and 7025–7125 MHz bands? If yes, which spectrum bands be related, what efficiency factor or formula should be used and what is the basis for the same? Please justify your suggestions.

IAFI Response:

It is a common practice in spectrum valuation to use the auction-determined prices of other, comparable bands as a basis of valuation for new or un-auctioned bands, such as the 6425–6725 MHz and 7025–7125 MHz bands. The application of a Spectral Efficiency Factor (SEF) is a crucial element in this method to account for the technical differences between the reference band and the new band.

The Mid-band 3300-3670 MHz can be considered for 5G, balancing good capacity with decent coverage and comparable to 6 GHz and 7 GHz bands. The valuation should incorporate a factor that adjusts for the difference in propagation characteristics, primarily coverage.

This factor should reflect the relative difference in the number of base stations required to cover the same area with the new band compared to the reference band.

$SEF_{6\ GHz}$ = Required Base Stations at 3300 MHz / Required Base Stations at 6 GHz

Since higher frequency bands require more base stations for equivalent coverage, the SEF for the 6 GHz/7 GHz bands, with reference to the 3.5 GHz band, will be less than 1.

The formula for the valuation of the new band is:

$$Price_{6\ GHz\ band} = Price_{3.5\ GHz\ band} \times SEF$$

Q-33. Should the auction determined price of other countries in 6 GHz spectrum bands serve as a basis of valuation of 6425- 6725 MHz & 7025-7125 MHz bands in India? What methodology should be followed for using this auction determined price as a basis for valuation? Support your suggestions with justifications and country-wise auction data.

IAFI Response:

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As auction-determined price of comparable mid-band spectrum of India is available, we may use the approach as specified in Q-32.

Q-34. If the above approach is considered appropriate, should the international auction-determined prices be normalized to account for cross-country differences such as population, GDP, purchasing power parity (PPP), subscriber base, and other relevant factors? If so, should normalization be carried out by using the ratio of auction prices of 6 GHz spectrum bands vs other mid band/mmWave band within the same country to neutralize the impact of cross-country differences? Alternatively, please suggest any other suitable normalization methodology that may be adopted in this context.

IAFI Response:

As auction-determined price of comparable mid-band spectrum of India is available, we may use the approach as specified in Q-32, to avoid complicating the issue unnecessarily

Q-35. Apart from the approaches highlighted above, which other valuation approaches may be adopted for the valuation of 6425 - 6725 MHz & 7025-7125 MHz bands? Please provide detailed information along with justifications.

IAFI Response:

As auction-determined price of comparable mid-band spectrum of India is available, we may use the approach as specified in Q-32.

Q-36. Should the auction determined price of other bands by using spectral efficiency factor serve as a basis of valuation for 600 MHz bands? If yes, which spectrum bands be related, what efficiency factor or formula should

be used and what is the basis for the same? Please justify your suggestions.

IAFI Response:

Yes, the auction-determined price of comparable low-band spectrum should serve as a basis of valuation for the 600 MHz band, using the Spectral Efficiency Factor (SEF) for technical normalization. The 600 MHz band should be primarily related to the other Sub-1 GHz bands already auctioned in India like 700 MHz, 800 MHz, and 900 MHz.

These bands share similar propagation characteristics, like excellent coverage and deep indoor penetration, makes them fundamentally comparable for delivering wide-area mobile services. The 600 MHz band offers better propagation than all three, making them suitable technical anchors for relative valuation.

The spectral efficiency factor (SEF) is generally used to relate the value of one band to another based on their technical differences. The formula should be based on the ratio of propagation advantages of 600 MHz compared to the anchor band, 700 MHz.

A common approach for low-band valuation is the **Cost-Based Spectral Efficiency Factor**, which is inversely proportional to the number of cell sites required for equivalent coverage, as requires less infrastructure investment for the same coverage footprint.

SEF_{cost} = Required Cell Sites for Anchor Band / Required Cell Sites for 600 MHz Band

$$\text{Price}_{600\ \text{MHz}} = \text{Price}_{700\ \text{MHz}} \times SEF_{cost}$$

Since the 600 MHz band remained unsold in the 2022 auction, there is no market-discovered price in India. Using the prices of the next most comparable bands 700 MHz provides the most realistic domestic anchor for valuation.

Q-37. Should the auction determined price of other countries in 600 MHz band serve as a basis of valuation of 600 MHz band in India? What methodology should be followed for using this auction determined price as

a basis for valuation? Support your suggestions with justifications and country-wise auction data.

IAFI Response:

As auction-determined price of comparable low-band spectrum of India is available, we may use the approach as specified in Q-36.

Q-38. If the above approach is considered appropriate, should the international auction-determined prices be normalized to account for cross-country differences such as population, GDP, purchasing power parity (PPP), subscriber base, and other relevant factors? If so, should normalization be carried out by using the ratio of auction prices of 600MHz band vs other sub GHz spectrum bands within the same country to neutralize the impact of cross-country differences? Alternatively, please suggest any other suitable normalization methodology that may be adopted in this context.

IAFI Response:

As auction-determined price of comparable low-band spectrum of India is available, we may use the approach as specified in Q-36, to avoid complicating the issue unnecessarily.

Q-39. Apart from the approaches highlighted above which other valuation approaches may be adopted for the valuation of 600 MHz band? Please provide detailed information.

IAFI Response:

As auction-determined price of comparable low-band spectrum of India is available, we may use the approach as specified in Q-36.

Q-40. Should the value of 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, 26 GHz, 6425- 6725 MHz & 7025-7125 MHz and 600 MHz bands be determined using a single valuation approach? If yes, please indicate which single valuation approach or method should be adopted in each case and provide detailed justification.

IAFI Response:

No, the value of the diverse spectrum band cannot be determined using a single valuation approach. Spectrum bands vary significantly in their propagation characteristics (coverage vs. capacity), technical ecosystem maturity, and commercial use cases. Relying on a single method for all bands, from sub-1GHz for coverage to 26 GHz for capacity, will produce misleading results and lead to inefficient pricing, as demonstrated by past unsold spectrum.

Q-41. In case your response to the above question is negative, will it be appropriate to take the average valuation (simple mean) of the valuations obtained through the different approaches attempted for valuation of the above spectrum bands, or some other approach like taking weighted mean etc. should be followed?

IAFI Response:

It would not be appropriate to take the simple arithmetic mean of the valuations obtained through different approaches.

Q-42. What ratio should be adopted between the reserve price for the auction and the valuation of the spectrum in 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, 26 GHz, 6425- 6725 MHz & 7025-7125 MHz and 600 MHz bands and why? Please support your answer with detailed justification.

IAFI Response:

A much lower ratio is mandatory for bands that were entirely or substantially unsold in 2024. The primary objective here is sale and utilization, not revenue. The minimum reserve price should be significantly reduced, so the valuation can prove a serious commitment to clear the inventory and incentivize bids.

For 600 MHz band, the RP must be discounted to compensate operators for the high technical/ecosystem risk associated with deploying unproven bands.

Q-43. What should the payment terms and associated conditions for the assignment of 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz, 26 GHz bands, 6425- 6725 MHz & 7025-7125 MHz bands and 600 MHz bands relating to:

(i) Upfront payment

(ii) Moratorium period

(iii) Total number of instalments to recover deferred payment

(iv) Applicable interest rate for protecting the NPV of bid amount

Please support your answer with detailed justification.

IAFI Response:

The payment terms should continue to be liberalized to reduce the initial cash flow burden on TSPs, promoting competition and investment in network roll-out.

Requirement of Upfront Payment should be eliminated and TSPs should have the option to pay the full bid amount in installments from day one. This frees up immediate cash for network CAPEX, which is a key goal for efficient utilization.

A minimum 6-year moratorium on deferred spectrum payments should be provided, to align with the long-term investment cycle of 5G/6G infrastructure, allowing operators to generate cash flow from new services before payments begin.

Current standard of 20 annual installments for the deferred payment component should continue, to provide a clear, long-term financial structure for a 20-year license.

Q-44. Any other suggestion relevant to the subject may be submitted with detailed justification.

IAFI Response:

<u>Requirement of spectrum for Audio PMSE Sector, a crucial contributor to National Economy</u>

Requirement of spectrum for Audio PMSE:

India's vibrant content creation sectors spanning Bollywood, music, and theatre are heavily reliant on high-quality audio production facilitated by wireless microphone systems. Operating within the 470-698 MHz spectrum range, audio PMSE plays a vital role in delivering extraordinary sound experiences to global audiences.

A notable example of audio PMSE's significance is seen in the extensive wireless installations at the Jio World Centre for the Reliance Group, demonstrating its role in executinglarge-scale events. While advancements in audio PMSE technology improve spectrum efficiency, they do not fully mitigate the challenges posed by diminishing spectrum availability due to reallocation to other services.

As TRAI and Department of Telecommunications (DoT) consider expanding cellular mobile services within the 600 MHz band, it is crucial to take into account the needs of current users in this spectrum. Ensuring a seamless transition and supporting ongoing operations for audio PMSE is vital to avoid any service disruptions.

a. Ensuring Uninterrupted Operations for Existing Audio PMSE Users in 600MHz Band

As TRAI navigates the process of auctioning the 600 MHz band for IMT, it becomes imperative to ensure that existing services in this band, particularly wireless microphone operations, are adequately supported during the transition.

This strategy offers a valuable framework for balancing the introduction of new services with operational continuity. The gradual reallocation of the 600 MHz band provides audio

PMSE users with sufficient time to transition to lower bands minimizing disruptions in their operations. Ensuring adequate access to the 600 MHz band during this transition period is crucial for the seamless execution of large-scale events.

Transition Plan for 600MHz:

Many frequencies in the TV bands that had been available for wireless microphone use prior to the auction will continue to be available after the transition period. These include:

- Certain frequencies in the 600 MHz guard band: 614-616 MHz.
- Certain frequencies in the 600 MHz duplex gap: 653-657 MHz for licensed use or 657-663 MHz for unlicensed use.
- Additional frequencies outside of the TV bands also are available for wireless microphone use.

IAFI recommends TRAI to consider implementing a transition strategy for audio PMSE users once the 600 MHz band auction decision is final. This approach would ensure seamless operations during the transition.

2. Strategic Utilization of the 600 MHz Band for Large-Scale Events:

The dynamic yet predicable nature of audio PMSE offers a potential mechanism by which the needs of audio PMSE can continue to be met through careful spectrum coordination

a. Special Temporary Approval in USA for Large Events

For extraordinary events, additional spectrum in addition to the recognized audio PMSE bands may be needed, to permit immediate or temporary operation of certain radio facilities during urgent conditions.

Spectrum may be granted in the following circumstances:

- In emergency situations, such as natural disasters.
- To permit restoration or relocation of existing facilities to continue communication service.

- For a temporary, non-recurring service where a regular authorization is not appropriate.
- In other situations, involving circumstances which are of such extraordinary nature that delay in the instruction of temporary operation would seriously prejudice the public interest.

Licensed wireless microphones are allocated the lower segment (653-657 MHz), while unlicensed wireless microphones utilize the upper segment (657-663 MHz).

b. Special Annual Events in India

Audio PMSE serves as a predictable application that can be effectively managed, especially during annual events that depend on the 600 MHz band in regions like Bhuj, Gujarat. Despite its proximity to the sensitive border with Pakistan, Bhuj continues to host the Navratri Festival, highlighting the importance of reliable audiovisual experiences to preserve cultural traditions. However, accessing the lower bands of UHF is not possible, likely due to military usage, complicating audio PMSE application deployment in such areas..

To ensure the continued success of such festivals, case-by-case coordination may be required for audio PMSE to operate in the 600 MHz band in specific locations. This offers a balanced solution to address spectrum scarcity while ensuring uninterrupted audio- visual experiences, thereby maintaining the integrity and success of the Navratri Festival in Bhuj.

In the event that the 600 MHz band is auctioned to mobile services, IAFI suggests that the 600 MHz band remain accessible for wireless microphone use, on case-by-case basis and specific event needs through coordination.

3. Conclusion

IAFI is fully committed supporting the audio PMSE sector, its operations, and the entertainment media industry in India. Recognizing this industry as a crucial contributor to the nation's economy, society, and cultural landscape. In light of potential changes to IMT spectrum auction, TRAI is requested to consider implementing a transition period similar to the approach adopted in the United States during the 600 MHz band auction. This strategic move would help facilitate

an orderly transition. Additionally, IAFI requests TRAI to adopt a staged transition/co-existence policy (similar to the US model) for the 600 MHz duplex gap (653-663 MHz), allowing for critical, coordinated, high-power Audio PMSE use for large-scale and cultural events on a case-by-case basis. This maintains a national cultural/economic interest while preserving the integrity of the new IMT band.

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Attachment 3

Brief about IAFI

The ITU-APT Foundation of India (IAFI) is a registered, non-profit, and non-political industry foundation dedicated to advancing the active participation of the private and corporate sector in the work of the International Telecommunication Union (ITU) and the Asia-Pacific Telecommunity (APT). IAFI's mission is to safeguard and promote the interests of the telecommunications and ICT sectors across the Asia-Pacific region, encompassing the full spectrum of technologies, services, and platforms; from GSO and NGSO satellites to mobile networks (4G/5G/6G), Wi-Fi 6e and 7, Private 4G/5G networks, and emerging innovations in digital communications, such as AI, Quantum Communications & Computing, Edge computing, cyber security, THz, and many more. IAFI serves as a vital industry platform connecting stakeholders, including operators, manufacturers, service providers, academia, and policymakers, with global and regional decision-making bodies. Through active engagement, IAFI facilitates India's industry voice in influential forums such as the ITU, APT, WWRF, FCC, and CEPT.

Recognized as a Regional/International Organization by the ITU, IAFI holds sector membership in ITU-R, ITU-T, and ITU-D, enabling it to directly contribute to global standards, spectrum policy, and development initiatives. IAFI is also an affiliate member of APT, strengthening its role in shaping regional ICT strategies. Each year, IAFI actively participates in a wide range of ITU and APT meetings, regularly submitting many contributions across all sectors to various ITU and APT study groups, working parties, events and conferences. These inputs influence key decisions on spectrum allocation, technology frameworks, regulatory best practices, and next-generation ICT developments. By fostering collaboration, promoting knowledge exchange, and ensuring Indian industry's representation in the global ICT dialogue, IAFI continues to be a trusted voice and advocate for a connected, innovative, and inclusive Asia-Pacific digital future.