

RJIL/TRAI/2026-27/168

2nd September 2026

To,

Shri Tejpal Singh,

Advisor (QoS-I)

Telecom Regulatory Authority of India,

Tower-F, World Trade Centre,

Nauroji Nagar, New Delhi – 110029.

Subject: RJIL's comments on TRAI's Consultation Paper on Draft Amendments in The Standards of Quality of Service of Access (Wireline and Wireless) and Broadband (Wireline and Wireless) Service Regulations, 2024.

Dear Sir,

Please find enclosed the comments of Reliance Jio Infocomm Limited (RJIL) on the TRAI's **Consultation Paper on Draft Amendments in The Standards of Quality of Service of Access (Wireline and Wireless) and Broadband (Wireline and Wireless) Service Regulations, 2024** dated 05.08.2026.

Thanking you,

Yours Sincerely,

For **Reliance Jio Infocomm Limited**

Kapoor Singh Guliani

Authorized Signatory

Enclosure: As above

Reliance Jio Infocomm Limited

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Reliance Jio Infocomm Limited's comments on TRAI's Consultation on draft amendment to 'The Standards of Quality of Service (QoS) of Access (wireline and wireless) and Broadband (wireline and wireless) Service Regulations, 2024'.

Preface:

1. Reliance Jio Infocomm Limited (RJIL) thanks the Authority for giving us an opportunity to offer comments on the important Consultation Paper on Draft Amendments in The Standards of Quality of Service of Access (Wireline and Wireless) and Broadband (Wireline and Wireless) Service Regulations, 2024.
2. At the very outset, we submit that we do not agree with the provisions proposed in the amendment as the same are not reasonable, feasible and do not add any value to the Quality of Service (QoS) or Quality of Experience (QoE) experienced by the customers. Our submission on the key issues under discussion are provided in following paras, which is followed by draft amendment wise response in the prescribed format.

A. Coverage Map Requirements

3. We submit that coverage maps are inherently theoretical/predictive tools generated through data-driven or Virtual Drive Test methodology, not guarantees of real-time, point-by-point service at every location. The actual coverage naturally varies due to terrain, weather, device type, network load, and other dynamic factors, thus, treating the coverage maps as precise verifiable measures against ground conditions is scientifically and operationally unrealistic and infeasible.
4. We further submit that the Authority has justified the proposed coverage-map accuracy and validation regime primarily by reference to "global trends". In order to understand the global requirements, we have carefully examined the "Global Best Practices" shared by the Authority and could deduce the following.
 - a. Only **one** of the four regulators surveyed (ARCEP, France) uses a 98% reliability threshold, and even that reference is asserted in a single line without disclosing ARCEP's sample size, confidence interval, or whether non-compliance triggers automatic monetary penalty the way Regulation 16/16A does. Furthermore, ARCEP reduces the threshold to 95% for smaller areas.
 - b. **Ofcom (UK)** validates *modelled predictions* against a statistical tolerance band (average error $\pm 3\text{dB}$, standard deviation up to 8dB), not a single-sample binary "accurate/inaccurate" test.
 - c. **FCC (USA)** uses a public/crowdsourced **challenge-and-concede process**, not a mandatory monthly per-LSA audit tied to automatic financial disincentive.

- d. **Bundesnetzagentur (Germany)** expresses coverage as a **cell-edge probability** (75–90%) rather than a percentage-accuracy benchmark on the published map itself.
- 5. Clearly, the proposal in the draft amendment is the strictest possible reproduction of only one jurisdiction under study. Furthermore, while the core numeric benchmark (98%) is drawn from ARCEP, the enforcement mechanism viz. monthly LSA-level sampling, per-sample binary pass/fail, automatic financial disincentive under Regulation 16(1)/16A) has no direct parallel in any of the global examples. Clearly, this implementation cannot be claimed to be based on global best practices.
- 6. Notwithstanding the same, there are following technical constraints in the Authority's proposal on coverage maps.
 - a. **RSRP as a coverage metric is flawed:** We submit that the RSRP measures received signal power, not service quality; LTE and 5G NR RSRP aren't directly comparable; massive MIMO beamforming can understate actual served coverage; thus, RSRP doesn't reliably predict real user experience and cannot be a coverage map metric.

Reference Signal Received Power (RSRP) no longer reflects the true performance capabilities of modern LTE and 5G networks. Today's networks deliver superior service quality even at much lower RSRP levels thanks to smarter radio technologies and advanced signal processing

Dynamic scheduling, adaptive modulation, and advanced error-correction techniques ensure continuity of service even when the signal strength weakens.

- b. **Proposed thresholds are incorrect:** We strongly object to classifying anything below –110 dBm as "No Coverage", as neither does it align with 3GPP standards nor DoT's own benchmarks (which treat >–110 dBm as excellent coverage for rollout compliance). We submit that the Authority should use more reasonable and technically aligned graduated scale for maps. We have provided our submissions on the enclosed table.
- c. **98% accuracy is unachievable:** The Authority is aware that the even 3GPP specifies that RF propagation (fading, shadowing, interference) has a probabilistic nature and no realistic field-measurement exercise could verify or sustain that level of point-level accuracy nationwide, and no comparable global regulatory

framework requires it. We have taken the strictest map parameters from France's ARCEP model and provided a table in Annexure to highlight the differences.

- d. **Process for validation:** The proposal to apply a +3 dB margin to measured RSRP obtained through TRAI Apps to account for prediction errors, while applying 0 dB margin to IDT samples, at all sample locations for validating the coverage maps published by TSPs, appears flawed, hypothetical, and technically unsubstantiated. Such an approach does not appear to be supported or aligned with the relevant international standard (ITU/3GPP) or any established practice adopted by global regulators, and no technical or empirical basis has been provided for applying a uniform margin +3 dBm margin far below the measurement uncertainty of the validation instrument at every location.
 - e. **Representation of default combined coverage map:** We submit that TRAI should kindly remove the ambiguity around the representation of the default combined coverage map. As under the current proposal, treating coverage from any technology above the prescribed "No Coverage" threshold as "covered" and representing it by the highest-generation technology available may lead to an inaccurate or potentially misleading representation of actual network availability and could place TSPs that have made substantial investments in 4G/5G rollout at a competitive disadvantage. TRAI may therefore consider a clear and technology-specific representation to ensure fair and accurate comparison.
 - f. **Website navigation mandate is overly prescriptive:** We submit that of late all divisions of TRAI seem to seek a separate corner for their division on the top navigation bar in the TSPs website, be it pertain to customer care, UCC or QoS and coverage statistics, despite of TRAI itself running a vibrant website. We submit that requiring a dedicated "Service Quality" tab specifically in the top navigation bar disregards that footer/bottom navigation is an equally standard, established practice (which is where this information currently sits), and would force disruptive changes to site design and should be avoided.
 - g. **Real-time validation and "amber marking" aren't feasible:** We submit that continuously cross-checking theoretical maps against live customer feedback and marking discrepancy zones with a 30-meter hexagonal grid is described as operationally impractical given how dynamic wireless networks are, with no clear criteria for when such a marking would be removed.
7. **Proposal of Financial Disincentives for map is unjustified:** We submit that as the gaps between theoretical maps and real-world experience are an inherent feature of

wireless networks, not a sign of operator fault, there is no justification for financial disincentives for such deviations.

8. **In view of the above, we submit that the Authority should remove the map related provisions from the Regulations and instead focus on providing broad principles for transparent, consumer-friendly coverage information, while leaving detailed methodology, tools, and validation processes to individual operators. We submit that such an approach will also be in line with the principles of a simplified, light-touch regulatory approach.**

B. Call Silence Rate

9. We respectfully submit that proposal to introduce "Call Silence Rate" as a separate mandatory QoS parameter for packet-based mobile networks (VoLTE/VoNR) which is not appropriate for following reasons:
 - a. **Redundancy:** Existing KPIs (DL/UL packet drop rate and voice packet loss, including cell-level reporting) already capture the technical conditions that would cause call silence, making a new parameter duplicative rather than informative.
 - b. **Measurement ambiguity:** Silence detection through RTP packet gaps can be misleading, since normal network mechanisms (like Discontinuous Transmission, Comfort Noise Generation, and codec-specific handling) intentionally reduce transmission during natural pauses in conversation. This could lead to false positives.
 - c. **Attribution problem:** Perceived silence or muted audio can stem from many factors outside the operator's network for instance handset issues, app behaviour, interconnection, or the far-end network, thus, attributing it solely to the operator's radio network would be inaccurate.
 - d. **No established standard:** There's no globally recognized practice or 3GPP counter for identifying an "unintended silence interval exceeding four seconds," so standard OSS platforms cannot reliably measure this on their own.
 - e. **Technical feasibility:** Certain network equipment (specifically Airspan/Samsung small-cell deployments) doesn't currently support this kind of measurement, risking incomplete reporting across the network. Further, even for supported equipment, the required measurement counters/parameters are presently not available. Implementing such reluctant/duplicate additional parameter would therefore require significant time, cost, and vendor-dependent development, subject to the readiness of respective equipment vendors.
10. **In view of the above, we submit that the Call Silence Rate should not be included in the QoS Regulations. However, in case the Authority still feels that there is a**

need to dig deep into this metric, then it can always opt to track it through drive-test observations, instead of making this a formal compliance requirement.

C. Network Slicing

11. We submit that Unified License conditions, the NIA provisions on technology neutrality accords the service providers the flexibility of deploying network slices (a core architectural feature under 3GPP release 15), as per their business plans without any regulatory hindrance.
12. However, the proposal to mandate a prior intimation of network slicing and a Physical Resource Block (PRB) utilization-based restrictions on slicing is effectively tying up the auctioned spectrum to a specific service category like eMBB, which is not part of the spectrum auction disclosures. We submit that such a mandate is against the letter and spirit of efficient spectrum utilization, technology neutrality and Ease of doing Business policies of the Government and should not be implemented.
13. We respectfully submit that network slicing is a fast-moving, dynamic capability tied to innovative and enterprise-specific 5G services and the mandate of advance notice for every new slice would slow down launches and limit responsiveness to market needs. Furthermore, disclosing detailed slice parameters in advance could reveal commercially sensitive product and network strategy information ahead of launch, weakening the competitive edge that comes with innovation. We submit that this will be a regressive step as over the years both DoT and TRAI's broader regulatory direction have been shifting away from prior-approval requirements toward post-launch intimation and this will be a step backward.
14. Notwithstanding the above, we further submit that a fixed 80% Physical Resource Block (PRB) utilization threshold as an automatic trigger for suspending or deactivating a network slice is not appropriate for following reasons:
 - a. Modern Massive MIMO radios support Multiuser MIMO (MU MIMO) which triggers at high PRB utilization (typically >80%). In MU-MIMO, the gNB allocates the same PRBs to multiple paired users simultaneously. This is achieved by activating additional MIMO layers, thereby increasing the overall effective PRB capacity beyond 100% when measured in the traditional non-Massive MIMO radio sense. This significantly improves spectral efficiency and helps protect the customer experience under high-load conditions. Such technological advancements, which dynamically provide additional capacity at high network load, make a fixed PRB utilization threshold irrelevant for Massive MIMO radios.

- b. Our network handles over 1600 Cr minutes of usage per day and implementing this new parameter is technically and operationally non feasible.
- c. PRB utilization is an internal radio-resource metric, not a direct measure of customer experience or service degradation.
- d. The same utilization level can produce very different outcomes depending on user load, RF conditions, interference, scheduling, and other factors, thus, a single static number can't meaningfully separate "acceptable" from "degraded" service across different cells and scenarios.
- e. Existing QoS and service-performance KPIs already provide a more direct, outcome-based way to assess actual service quality, making an additional PRB-based trigger redundant and administratively burdensome.

15. In view of the above, we submit that prior intimation of network slicing and PRB based restrictions on slicing should not be implemented. If at all an intimation is required, it should be post launch in line with tariff reporting.

D. Significant Network Outage (SNO) and related provisions

16. At the very outset, we submit that the current definition for Significant Network Outage (SNO) is sufficient and adequately captures materially significant outages, with respect to both aspects viz. duration of outage and scale of the outage and there is no need to redefine this for the purpose of QoS Regulations.
17. We submit that the approach towards SNO should be calibrated and should not dissuade the service providers from roll-out objectives. We submit that already the impact of SNO regulations is apparent in the market and there is inertia towards rolling out in smaller and geographically isolated areas. In such areas minor aberrations in one or two sites can impact 10% or more users, despite the absolute number being in 10s or low 100s and trigger SNO provisions, thus, further lowering the criteria will only keep the uncovered areas underserved. We have highlighted the genuine operational difficulties of restoring service in remote or difficult terrain for consideration in the enclosed table and request that the same may be recognized, otherwise may lose the opportunity of connecting users in zeal for over regulation.
18. Further on the related aspect, we strongly oppose the proposal of rent rebate for wireless users as on one side this has massive operational difficulties in calculating per-subscriber impact, the absence of established international norms on the other hand it is against the well-established, legal principle (enunciated by Hon'ble Supreme Court) that regulation should avoid disproportionate or arbitrary measures. We submit that such wide-ranging rent rebate on wireless subscribers may also create unwanted inflationary pressure in the market.

- 19. In view of this, we submit that the SNO parameter should not be included in mandatory QoS compliance reporting with financial disincentives or rebates.**

E. Proposals pertaining to typical download/upload speed

- 20. Wireless:** We reiterate our submissions that minimum speed on wireless networks is not technically feasible, as the actual speed experienced by a customer depends heavily on factors outside the TSP's control viz. device capability, indoor/outdoor location, distance from the cell site, number of connected users, the type of website or app being accessed, IPv4 vs. IPv6, terrain, backhaul connectivity, and general network conditions, obviating the reasonability of holding the TSP responsible. Furthermore, the service quality can also be affected by external events like international submarine cable faults, and even when traffic is rerouted through alternate paths, those paths may already be congested or capacity-constrained again, circumstances beyond the TSP's control. Thus, the requirement in case of wireless networks is not an operationally realistic possibility and shouldn't be made mandatory.
- 21. Wireline:** We submit that wireline plans are generally built around a committed speed up to a specified limit, however, meeting the benchmark 100% of the times is neither operationally feasible nor practically achievable, due to various external factors like local disruptions, extreme weather, access constraints, last-mile issues, power outages, equipment failures, and submarine cable damage.
- 22. In view of the above, we reiterate that the Authority should not mandate a 100% compliance benchmark for parameters that TSPs cannot fully control at all times.**

F. Timeline for resolving Billing related complaints

- 23.** We submit that the current requirement of resolving 100% of billing/charging complaints within four weeks is well defined framework and working well. We see no justification in changing this requirement. The mere fact that the TSPs are able to comply with a parameter should not be a reason for changing the benchmarks. The reduction of the timeline to one week will effectively require the TSPs to focus more on closure than on providing an accurate closure. Especially, when in many cases like international roaming the dependency is on partners that have no obligation to comply with TRAI's revised timelines. We submit that prescribing an unduly short resolution timeline will inevitably impact on the resolution quality and should be avoided.

G. Quality of Experience Score (QoES)

24. At the very outset, we submit that it is imperative that before including a new measure in the QoS Regulations, the Authority should share the complete methodology, including and not limited to the parameters, data sources, measurement and computation approach, weighting methodology, validation process, and publication framework for detailed industry consultation before any implementation.
25. Notwithstanding the same, we submit that consolidating multiple performance dimensions into one composite score may not adequately represent actual customer experience and such a methodology should be avoided. Not only will this be an incorrect representation, but it will also strong performance in one area to offset poor performance in another, obscuring specific deficiencies that need attention.
26. It is submitted that the Quality of Experience (QoE) should be crowd sourced and focused on the actual experience shared by customers and not based on the Authority's interpretation of the reports submitted by the TSPs to be effective.
27. We submit that in the current form and basis the current information available with the TSPs, it appears to be a case of increase in regulatory burden without any commensurate benefits to any stakeholder. Accordingly, we submit that for such case, the Authority is requested to carry out a Regulatory Impact Assessment before straight away issuing a draft Regulation.

H. Futility of Financial Disincentives

28. As submitted during consultation on other draft Regulations, we reiterate that RJIL has always maintained that the Financial Disincentive (FDs) are not legally tenable and the concept of FDs is an aberration in a progressive regulatory framework built on Forbearance, Light Touch Regulations and co-regulation and the Authority should not introduce and FD measures under any Regulation. We further submit that there can be no better measure of inadequacy of network quality than the loss of customer for a TSP.
29. We reiterate that the financial disincentives often fail to improve compliance as by monetizing the compliance, a regulator puts a price on compliance and provides an option on whether to comply as a principle or pay for non-compliance, thereby culling out the duty and rule-based compliance, which is now replaced by cost-benefit calculation. In case the interest is to improve customer experience, then the focus should be on improving the overall holistic network experience based on crowd sourcing and not just dispense FD orders. FDs will only lead to the same being treated as cost of doing business, without ever addressing the root cause of the issue. We submit that the optimum solution is simplification, support and guidance.

30. We further submit that the draft amendment is further enhancing the scope of FDs, by seeking to penalize even minor mismatches in the output when the primary data is also submitted to TRAI and for cases where there are mismatches in the data submitted to different divisions of TRAI. We are constrained to submit that it is perverse to demand same and similar data in multiple reports and then compare the same and seek to penalize for mismatches, if any. If the focus is on accuracy, then collect a single centralized report of primary data and compute the outputs on your own. TRAI's different divisions should be able to draw their own data from this only. We have submitted this proposal even as part of TRAI consultation on Ease of Doing Business. However, the number of reports seems to continue increasing with each department seeking own reports and keen to impose FDs.

31. We submit it is critical to use the phrase 'False Reporting' very carefully. It can be applied only when there is demonstrated intent behind a deliberate/material variance in reporting. The possibility of inadvertent clerical or computational errors, especially when we are dealing with massive amount of data, should be acknowledged and kept out of the purview of claims of False Reporting.

32. Conclusions

- 1. The draft Amendment does not add any value to the QoS Regulations and should be withdrawn.**
- 2. The provisions pertaining to coverage maps are impractical to implement and do not add any value.**
- 3. The Authority should only provide broad principles for transparent, consumer-friendly coverage information, while leaving detailed methodology, tools, and validation processes to individual operators.**
- 4. The Call Silence Rate parameter is not suitable for data centric technologies and should not be included in the QoS Regulations.**
- 5. The provisions pertaining to prior intimation of network slicing and PRB based restrictions on slicing should not be implemented.**
- 6. SNO parameter should not be included in mandatory QoS compliance reporting with financial disincentives or rebates.**
- 7. There should be no change in timelines and other parameters of complaint handling.**
- 8. There is a need for wider discussion on Quality of Experience Score as not sufficient details have been provided in the consultation. Further, a single value output will not be appropriate measure for QoE.**
- 9. The provisions related to Financial Disincentives are perverse and should be removed completely from all Regulations.**

S. No.	Para number of draft notification	Draft Amended para/sub-regulation	Input/ Comment/ Counter- Comment	Justification with supporting reference, if any
1	Para 4.a (Sub-regulation 6.1.i)	Accuracy of service wise geospatial coverage map published on service provider's website (Benchmark $\geq 98\%$)	The proposed amendment not only goes against the intended framework of the QoS Regulations but is also technically and operationally impracticable to achieve . Even assuming that such accuracy were sought to be measured or ensured, TSPs would be required to undertake 100% exhaustive field measurements across the relevant geographic areas, involving significant operational expenditure and deployment of substantial manpower. Such an exercise, however, would not provide any meaningful or sustainable	It is submitted that the level of accuracy of coverage depicted in the coverage maps is adequate for their intended purpose and represents theoretical or expected average coverage, consistent with the intent and framework of the Quality of Service (QoS) Regulations, 2024. The coverage maps are generated using a data-driven / Virtual Drive Test (VDT)-based methodology, based on relevant network and geographic inputs, including site locations, frequency spectrum, antenna configurations, terrain and other applicable parameters. Such coverage maps are inherently predictive and indicative in nature and are not intended to represent real-time, point-by-point coverage or individual customer experience at every geographical location. Actual coverage and service quality may vary due to several dynamic and external factors, including terrain, weather, foliage, signal fluctuations, network modifications, construction activities, building penetration loss, device capabilities, network load, user density, foliage and other physical obstructions. Accordingly, it is neither technically feasible nor operationally practicable to measure, maintain or ensure such an accuracy level of 98% or higher when predictive coverage maps are compared against actual ground-level coverage. From a scientific and engineering perspective, RF propagation prediction has inherent limitations that preclude very high point-level accuracy. These include the probabilistic nature of radio propagation, log-normal shadowing and multipath fading; small-scale fading and spatial signal variations, which can occur over distances of the order of a fraction of the wavelength; the statistical nature of empirical and standardized propagation models, including those specified in relevant 3GPP frameworks; dynamic and traffic-

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			improvement in the accuracy of coverage representation, given the inherently dynamic and continuously changing nature of wireless networks. Accordingly, it is respectfully recommended that the proposed amendment be withdrawn, as it is neither technically nor operationally feasible and would impose disproportionate costs and resource requirements without delivering any meaningful improvement in the representation or assessment of network coverage or any	dependent interference; and environmental and temporal variations such as foliage, weather and moving objects. These factors cannot be fully captured in a static or predictive coverage map. Further, any requirement to achieve and demonstrate 98% or higher point-level accuracy against actual ground conditions would effectively require extensive field measurements across the entire geographic area at the prescribed spatial resolution, with repeated measurements as network configuration and environmental conditions change. Such an exercise would be operationally impractical and technically unfeasible for a nationwide mobile network. Moreover, field measurements themselves represent radio conditions at a particular location and point in time and may subsequently change due to antenna azimuth or tilt adjustments, power changes, network configuration modifications, new buildings or infrastructure, changes in the surrounding radio environment, building penetration loss, foliage, network load, weather and other factors. Consequently, even extensive field measurements cannot provide a permanently current, point-by-point representation of nationwide coverage. Accordingly, no realistic field-measurement exercise can establish or permanently maintain a fixed point-level accuracy of a predictive coverage map against actual coverage conditions. Such a requirement would not account for the dynamic and inherently variable nature of mobile radio networks. Coverage maps should therefore appropriately be understood as representing expected coverage under defined engineering assumptions, rather than as a guarantee of actual coverage at every

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			commensurate benefit to customers. Instead, such financial and human resources would be more effectively utilised by TSPs towards network enhancement, capacity augmentation, service quality improvement and improved customer experience and satisfaction.	geographical point or a direct representation of individual customer experience. Actual user experience is appropriately assessed through the prescribed QoS performance parameters. Concerns with Mandatory RSRP-Based Coverage Classification: Therefore, mandating RSRP-based coverage classification is not technically or practically recommended, for the following reasons: 1. RSRP is a received power metric, not, by itself is a service-quality metric 2. A single RSRP threshold framework may not be uniformly applicable across technologies, frequency bands and bandwidth configurations 3. LTE RSRP and NR RSRP are not the same measurement and are not directly comparable. 4. Massive MIMO beamforming makes SSB-RSRP a systematic understatement of served coverage. 5. Classifying RSRP <-110 dBm as "No coverage" is factually incorrect. 6. RSRP-based coverage classification ignores the device uplink Tx power and uplink interference caused by external sources. With newer devices supporting higher uplink Tx power (Power Class 2 as 26 dBm and Power Class 1.5 as 29 dBm), higher layers, receive diversity, the coverage gets extended further 7. The descriptive text associated with each RSRP level may imply service-performance claims that RSRP alone cannot substantiate. 8. RSRP is load-independent, whereas user experience is load-dependent. 9. Reference Signal Received Power (RSRP) no longer reflects the true performance capabilities of modern LTE and 5G networks. Today's

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				networks deliver superior service quality even at much lower RSRP levels thanks to smarter radio technologies and advanced signal processing 10. Dynamic scheduling, adaptive modulation, and advanced error-correction techniques ensure continuity of service even when the signal strength weakens. Concerns with Proposed Accuracy Requirements and Penalties: Further, the proposed accuracy requirements and associated penalties may not be appropriate for enforcement, considering the following technical and practical considerations: 1. A 98% accuracy benchmark exceeds the intrinsic accuracy limits of RF propagation prediction. 2. No major global regulatory framework prescribes a directly comparable accuracy benchmark for public RF coverage maps. 3. A +3 dB margin is substantially smaller than the measurement uncertainty of the validation process itself. 4. Sample geolocation uncertainty can be comparable to the prescribed grid size itself 5. Outdoor RF predictions cannot be directly validated against indoor measurements. 6. The proposed accuracy formula does not incorporate adequate statistical safeguards. 7. The proposed 3D digital-map requirement may not be practically achievable at a national scale

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				8. The computational requirements and data volumes associated with the prescribed resolution and update cadence may not be operationally sustainable. 9. Cell-level signal-strength disclosure may raise security, confidentiality and commercially sensitive information concerns. 10. The proposed amber-marking provision introduces a second, potentially conflicting grid/reference framework and does not define clear exit criteria 11. A 1% tolerance for false reporting is smaller than the uncertainty inherent in the proposed validation methodology It is therefore proposed that TRAI adopt a data-driven coverage analysis methodology using MDT feature rather than relying solely on RSRP/drive-test-based assessments. The MDT feature ensures accurate lat /long reporting for the data driven coverage analysis. Accordingly, Annexure-I provides a detailed description of the proposed data-driven methodology, along with the technical and practical challenges associated with RSRP-based coverage classification and point-level accuracy assessment. Further, if the proposed benchmark is mandated, there is a risk that TSPs may be deemed non-compliant and become subject to financial disincentives without necessarily resulting in a commensurate improvement in customer experience. While the proposed approach appears to draw reference from the framework adopted by ARCEP in France, the regulatory, technical, geographic, network

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				and operational conditions in France and India are materially different. Accordingly, the applicability of the French framework to the Indian context should be assessed with due consideration to these differences, particularly given the substantially larger geographic area, population, network scale and diversity of deployment conditions in India. In this regard, Annexure-II provides a comparative assessment of the relevant regulatory frameworks and requirements applicable in India and France. The comparison highlights material differences in the regulatory approach, network characteristics, geographic diversity and operational environment, which should be considered while evaluating the suitability and proportionality of the proposed requirements for India. In view of the above, it is submitted that imposing or requiring point-level accuracy for predictive coverage maps, or treating such maps as representative of actual customer experience, would be scientifically, technically and operationally impracticable and should therefore not be mandated. If TRAI nevertheless intends to introduce such an assessment, it is suggested that it should preferably be based on data-driven models and/or crowdsourced data collected directly by TRAI, and used primarily for network rating, benchmarking and public information, rather than being treated as a mandatory KPI or compliance benchmark carrying financial penalties for TSPs. Finally, any KPI requiring repeated validation across the entire geographical area would impose a significant and recurring regulatory compliance burden on TSPs, including substantial costs associated with field measurement, data

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				collection, validation, modelling and network reassessment. Such additional regulatory costs could ultimately place upward pressure on the cost of providing telecom services and, depending on the extent of the requirements, TSPs may be compelled that such unreasonable additional regulatory costs may ultimately have to be passed on, directly to consumers. A resource-intensive KPI should therefore be carefully evaluated against its incremental benefit to customer experience and the proportionality of the associated compliance burden.
2	Para 4.a (Sub-regulation 6.1.iv)	Note: Significant Network Outage is defined as an event where access service (wireless) In a district remains unavailable for a continuous period exceeding four (4) hours, or where more than ten percent (10%) of subscribers in the Licensed Service Area (LSA) Experience complete loss of Service for a continuous period exceeding four (4) hours. Rebate to the subscribers for significant network outages of more than 24 hrs: 1. For post-paid subscribers registered in the district or	Existing definition of Significant Network Outage (SNO) already captures materially significant outages and is not limited to a narrow category of incidents and hence it is suggested it should be continued.	It is submitted that the existing definition of Significant Network Outage (SNO) already captures materially significant outages, taking into account both the duration and scale of impact. Accordingly, the fact that SNO instances may be limited or nil for certain TSPs should not, by itself, justify expanding the definition or lowering the existing thresholds. A low incidence of SNO may, in fact, indicate TSPs effective network resilience and restoration mechanisms. The existing definition is particularly stringent, particularly in the case of smaller districts and geographically isolated areas, where network sites, population density and subscriber numbers may be limited. In certain districts, wireless coverage may be provided through only one or two sites, such that an outage at a single site could result in more than 10% of subscribers losing service and trigger the SNO criteria, despite the relatively limited absolute number of affected subscribers and geographical impact. Further lowering the thresholds or expanding the scope may therefore result

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		affected post-paid subscribers, as applicable: Proportional rent rebate, as per plan charges, for affected number of days shall be credited in next bill. 2. For the pre-paid subscribers registered in the district or affected pre-paid subscribers, as applicable: The validity of subscribed tariff offering shall be increased by equal number of affected days.		in disproportionate regulatory consequences without necessarily reflecting the actual materiality of consumer impact. The Authority may also consider the significant operational challenges involved in network deployment and restoration in difficult and geographically challenging areas, including Local Public Issues, Catastrophic Weather, Access Issues, Last-Mile Connectivity Issues, Electrical Breakdown, Fiber Cuts, external interference, jammers, site owner/municipal permission issues, etc. Infrastructure deployment, site access, transportation and mobilisation of restoration teams in such areas can be considerably more difficult and time-consuming than in densely populated urban areas. The Authority has itself recognised these operational and geographical challenges; however, no corresponding exclusion, relaxation or appropriate treatment has been provided under the QoS framework for such circumstances. With regard to the proposed rental rebates for SNO, it is reiterated that such a requirement is not appropriate for wireless services and may give rise to significant practical, technical and regulatory concerns. Calculating rebates for wireless networks for impacted subscriber in a specific area presents operational challenges; service agreements may already specify applicable outage-related terms; there is a lack of established international standards and practices; and the regulatory framework should, consistent with the principles laid down by the Hon'ble Supreme Court of India, avoid arbitrary or disproportionate regulatory measures.

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				Regulatory mandates of this nature have already discouraged TSPs from expanding networks in remote or challenging terrains . The framework should therefore balance consumer protection with the practical realities of network deployment and restoration. Accordingly, the SNO parameter should ideally not form part of QoS compliance reporting with financial disincentives or mandatory rental rebates. Alternatively, if the Authority considers it necessary to retain the SNO parameter for monitoring network resilience and service availability, it is requested that it be retained only as a monitoring parameter, without financial disincentives or mandatory rental rebates .
3	Para 4.a (Sub-regulation 6.1.xiv)	Tariff offerings in which 80th percentile value of measured download and upload speed is $\geq$ offered typical download and upload speed for 4G/5G technology (Benchmark: 100%)	It may not be operationally and technically feasible to meet the prescribed benchmark of 100% all the time.	In reference to the proposed change in the parameter, calculation methodology and the corresponding benchmark of 100%, i.e., the 80th percentile value of download and upload speed should be > greater than the offered typical download/upload speed, we would once again like to emphasise that it is not technically feasible to guarantee any minimum speed in the case of wireless networks. The speed experienced by a customer on a wireless network depends on several factors, many of which are beyond the control of the TSP. These include the customer's handset/device capabilities, location (indoor or outdoor), distance from the cell site, number of connected users, type of website or application being accessed, whether the website/application is accessed over IPv6 or IPv4, topography, backhaul connectivity, network conditions, external interference, atmospheric ducting, jammers and various other technical and environmental factors.

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				Further, as highlighted in the industry's submissions on the Consultation Paper concerning wireless data services, service quality can also be severely impacted by events such as damage to or faults in international submarine cables. Even where alternate routes or paths are utilised, congestion and limited availability on such alternate routes can significantly affect network performance. Such circumstances are beyond the operational control of TSPs and may result in degradation of service quality despite all reasonable efforts being undertaken by the TSP. In view of the above challenges, it is not operationally or technically feasible for TSPs to ensure that the typical download/upload speed is met at all times across a wireless network. Accordingly, we submit that such a technically inappropriate parameter should ideally not be imposed as a mandatory requirement on TSPs. However, if the Authority is of the view that the parameter should be retained, we submit that it should, at most, be treated as a monitoring parameter rather than as a mandatory compliance requirement. More importantly, the applicability of a 100% benchmark for wireless networks should be revisited, considering the fundamental variability and the numerous factors affecting wireless network performance that are beyond the control of TSPs.
4	Para 4.b (Sub-regulation 6.1.xiv)	Cells having daily PRB utilisation > 80% (in 5G network) (Benchmark: ≤ 1%)	It is submitted that, PRB utilization may be considered as an indicative/reference	It is submitted that the existing DoT authorization / licensing framework, applicable spectrum-assignment conditions and recognition of network slicing provide TSPs with the requisite flexibility to utilize their authorised network and spectrum resources for differentiated services, subject to

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			parameter for monitoring radio resource utilization. However, no fixed PRB utilization threshold shall be prescribed as a mandatory or standalone criterion for determining service degradation or triggering deactivation/suspension of non-default slices. Assessment of actual service performance and customer experience shall continue to be based on the applicable QoS and service-performance KPIs.	applicable regulatory conditions. The applicable framework does not prescribe that spectrum acquired by TSPs through auction is restricted to a particular service category, including eMBB, where its use is within the scope of the applicable service authorisation. Accordingly, the utilisation and management of spectrum acquired through auction should be left to the discretion of TSPs, thereby enabling them to optimise spectrum utilisation, respond to market requirements and realise an appropriate return on their substantial investments in spectrum and network expansion. Further, in this context, prescribing a fixed PRB utilisation threshold, such as 80%, as a mandatory regulatory trigger for suspension or deactivation of a network slice would be disproportionate and technically inappropriate and will also impact potential serving customers through such slice. PRB utilisation is an internal radio-resource management parameter and, by itself, cannot be treated as a determinative indicator of service degradation or customer experience. The appropriate network-management action depends on prevailing network conditions and a combination of factors, including user load and distribution, traffic characteristics, RF conditions, CQI/MCS/BLER, interference, spectral efficiency, scheduler and resource-allocation mechanisms, QoS priorities and applicable service requirements. Accordingly, the same level of PRB utilisation may result in materially different service outcomes across different cells, technologies and deployment scenarios. A static threshold such as 80% therefore cannot represent a

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				universally applicable boundary between acceptable and degraded service performance. Its use as an automatic regulatory trigger may unnecessarily constrain the TSPs ability to dynamically manage radio resources and optimise network performance. Further, the objective of ensuring service performance and customer experience is already addressed through the existing QoS and service-performance KPI framework, which provides a more direct assessment of the actual service outcome. Introducing an additional mandatory PRB-based trigger may therefore not provide any commensurate regulatory or consumer benefit, while potentially requiring additional monitoring, reporting and operational processes. Modern Massive MIMO radios support Multiuser MIMO (MU MIMO) which triggers at high PRB utilization (typically >80%). In MU-MIMO, the gNB allocates the same PRBs to multiple paired users simultaneously. This is achieved by activating additional MIMO layers, thereby increasing the overall effective PRB capacity beyond 100% when measured in the traditional non-Massive MIMO radio sense. This significantly improves spectral efficiency and helps protect the customer's experience under high-load conditions. Such technological advancements, which dynamically provide additional capacity at high network load, make a fixed PRB utilization threshold irrelevant for Massive MIMO radios. In addition to the above submission, a field and laboratory case study demonstrating the capacity gains from MU-MIMO on Massive MIMO 5G radios under high-loading conditions is enclosed herewith as Annexure-III.

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				In the principal downlink test, the physical resource grid comprised approximately 210 resource blocks (RBs). Under SU-MIMO, an average of 182 RBs (87% of the available grid) was allocated per handset, delivering just over 911 Mbps. With MU-MIMO enabled and eight handsets served simultaneously, aggregate RB allocations reached 1,407—an increase of 672%—while average MIMO layers increased from 3.4 to 13 (282% increase). Average throughput rose to 2,909 Mbps, a 219% increase. The study describes the result as “a near-perfect reuse of all available RBs by the eight smartphones used in the test.” The regulatory framework should accordingly remain outcome-oriented, focusing on the actual service performance of the relevant slice rather than prescribing an internal network-management parameter as a mandatory trigger. PRB utilisation may be monitored and considered as an indicative/supporting parameter for network-resource management; however, it should not independently determine suspension or deactivation of a slice by Authority. In view of the above, we submit that: 1. PRB utilisation should not be prescribed as a mandatory or standalone criterion for slice suspension/deactivation. 2. No fixed threshold, including 80% PRB utilisation, should be mandated as an automatic regulatory trigger. MU MIMO makes the PRB threshold as redundant.

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				3. PRB utilisation, if considered necessary, may be retained only as an indicative/reference parameter for monitoring radio-resource utilisation. 4. The existing QoS and service-performance KPIs should remain the basis for assessing actual service performance, without introducing additional KPI or reporting obligations solely for PRB-based assessment. 5. TSps should retain sufficient flexibility to determine appropriate slice-management actions based on prevailing network conditions, network architecture and applicable service requirements. Accordingly, it is requests that no mandatory static PRB utilisation threshold be prescribed for slice-management decisions, particularly where such threshold does not directly establish service degradation and may interfere with the TSPs legitimate network and spectrum-management flexibility. The existing QoS KPI framework may appropriately be relied upon for assessing actual service performance, without imposing additional KPI or reporting requirements solely for PRB-based assessment.
5	Para 4.d (Sub-regulation 6)	Every service provider, planning to create a new network slice in their 5G network, shall submit the details of proposed and existing network slice parameters, at least twenty one (21) days in advance to the Authority, clearly demonstrating the availability of		It is submitted that the proposed requirement mandating every TSP to submit details of proposed and existing network-slice parameters at least 21 days in advance of creating a new network slice is unduly prescriptive and inconsistent with the Government's stated objective of Ease of Doing Business and a light-touch regulatory framework. The requirement is particularly concerning given the rapidly evolving nature of 5G technologies and the emergence of innovative, differentiated and

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		sufficient capacity in the cell(s) which are part of different slices, in such manner and format as may be directed by the Authority, from time to time.		enterprise-specific services. Network slicing is inherently a dynamic network-management and service-enablement capability and requiring prior regulatory intimation for every new slice may introduce unnecessary administrative delays and constrain the ability of TSPs to rapidly launch and modify innovative services in response to market requirements. It is also pertinent that the DoT has progressively moved towards removing prior approval/intimation requirements for service launches and adopting a more facilitative regulatory approach. Similarly, even under the Authority's tariff framework, the regulatory approach has evolved from prior submission requirements towards post-launch intimation within the prescribed timeframe. The proposed 21-day prior submission requirement for network slices therefore appears regressive and inconsistent with this broader regulatory framework. Further, requiring TSPs to disclose detailed proposed and existing slice parameters in advance may also result in the disclosure of commercially sensitive and competitively significant information relating to planned products, services, network configurations and business strategies. Such advance disclosure could potentially dilute the competitive advantage associated with innovation and may expose commercially sensitive plans before the service is launched. Accordingly, it is recommended that the proposed 21-day prior intimation requirement be withdrawn. If the Authority considers that regulatory visibility over newly introduced network slices is necessary, the same may instead be

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				addressed through a post-launch intimation/reporting mechanism , based on suitably defined and limited information requirements, enabling the Authority to monitor developments while allowing TSPs the necessary flexibility to rapidly introduce innovative services, respond to market demand and maintain the competitive benefits of innovation , consistent with the principles of Ease of Doing Business and a light-touch regulatory framework.
6	Para 5 (Sub-regulation 7.1.vi)	Silence Call Rate (Benchmark: $\leq$ 1%)	It is submitted that the objective sought to be achieved through the proposed parameter is already adequately addressed under the existing QoS measurement and reporting framework through parameters relating to downlink packet drop rate and uplink packet drop rate , measured at the lowest granularity, i.e., at the cell level.	It is submitted that voice service quality in packet-based mobile networks is already assessed through established packet-performance KPIs under the existing regulatory framework. In VoLTE, VoNR and other packet-switched voice services, instances of call silence or muted voice perception may arise from non-delivery, delay, degradation or loss of voice packets in the uplink or downlink direction. Such packet-level behavior is already captured under the existing framework through DL packet drop rate and UL packet drop rate, including cell-level reporting, as well as through measurement of voice packet loss as part of the applicable QoS/service-performance assessment mechanism. These parameters are well-established, technically relevant and aligned with the manner in which packet-based voice traffic is engineered, monitored and reported by TSPs. TSPs are already reporting such parameters at the prescribed level of granularity, including at the cell level, thereby enabling the Authority to assess actual network performance and its impact on voice service quality.

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			Further, RTP packet gaps cannot, by themselves, be automatically interpreted as silence events. There is also no standard 3GPP counter that directly identifies whether an established voice call has experienced an unintended silence interval exceeding four seconds. In the absence of such a standardised measurement, the proposed parameter would constitute a non-standard and duplicative measure addressing the same service-performance aspect, namely, the loss or non-delivery of voice packets that may affect voice quality.	Introducing a separate Call Silence Rate parameter would, therefore, not provide any materially distinct assessment of service performance, since the underlying technical conditions and measurement objectives are already substantially covered through the existing packet-drop and voice-packet-loss KPIs. It would instead create an additional layer of compliance, reporting and reconciliation in respect of substantially the same underlying network conditions. Furthermore, RTP packet gaps cannot automatically be interpreted as silence events. Modern voice networks employ several mechanisms that intentionally suppress or alter voice packet transmission during periods of conversational silence, including: • Discontinuous Transmission (DTX); • Silence Insertion Descriptor (SID) frames; • Comfort Noise Generation (CNG); and • Codec-specific handling of speech inactivity. As a result, reliance on RTP gaps or similar indicators may result in significant false positives and inaccurate measurements. Silence or muted voice perception during a call may arise from multiple factors that cannot necessarily be attributed solely to the TSP's radio network, including device behaviour, handset microphone or speaker issues, codec implementation, application or terminal-side processing, radio conditions, mobility, coverage variation, user environment, customer-premises conditions, interconnection, or far-end network behaviour.

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			Accordingly, it is suggested that the proposal to introduce such a parameter be withdrawn from the QoS measurement and reporting framework. If the Authority nevertheless considers it necessary to observe such instances as part of its assessment, the same may be retained solely as an IDT/drive-test-based observation, without introducing it as an additional mandatory QoS KPI or PMR reporting requirement.	Accordingly, treating Call Silence Rate as an independent mandatory QoS parameter may not accurately reflect the actual network performance of the TSP and could result in an inaccurate or duplicative regulatory assessment. It is also submitted that there is no globally established practice or regulatory requirement for reporting Call Silence Rate as an OSS-based network KPI. A standard OSS platform relying on network counters cannot, by itself, unambiguously determine whether an established voice call experienced an unintended silence interval exceeding four seconds. In particular, there is currently no standard 3GPP counter that directly identifies whether an established voice call experienced an unintended silence interval exceeding four seconds. Further, the proposed Call Silence Rate requirement presents significant implementation challenges. Our network handles > 1600 Cr minutes of usage per day and implementing this new parameter is technically and operationally non feasible. Additionally, the required measurement capability cannot be supported for the small-cell deployments in our network, and the relevant Airspan/Samsung equipment vendors currently do not support the prescribed measurement. Consequently, notwithstanding efforts to implement such a parameter, its measurement and reporting may not be technically feasible across all cells in the network. This may result in incomplete measurement and reporting. The formula proposed has an error in the sense that every instance of call silence $\geq 4s$ is to be counted separately in the same call. This will grossly

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				give a misleading indication as the numerator may be larger than the denominator. The existing QoS KPI framework should therefore be relied upon for assessing actual service performance, particularly since DL packet drop, UL packet drop and voice packet loss already provide an objective, technically established and network-level basis for assessing packet-based voice service quality. Accordingly, it is respectfully requested that the proposed Call Silence Rate parameter not be introduced as a separate mandatory QoS KPI or PMR reporting requirement. If the Authority nevertheless considers it necessary to observe such instances as part of its assessment, the same may be retained solely as an IDT/drive-test-based observation, without introducing it as an additional mandatory QoS KPI or PMR reporting requirement.
7	Para 6.a (Sub-regulation 9.1.iv)	Tariff offerings in which 90 th percentile value of measured download and upload speed is $\geq$ offered typical download and upload speed (Benchmark: 100%)	Compliance with a 100% benchmark at all times is not operationally feasible.	It is submitted that, in the case of wireline (broadband) services, tariff offerings are, in principle, based on a committed or prescribed speed up to a specified limit, depending upon the plan opted for by the subscriber. However, considering the operational and technical challenges involved, meeting the prescribed benchmark of 100% at all times may not be feasible in certain specific circumstances. For instance, partial damage to the backhaul optical fibre network or network equipment may not be capable of being rectified immediately due to circumstances including, inter alia: (i) local public issues; (ii) catastrophic

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				weather conditions; (iii) access-related issues; (iv) last-mile connectivity issues; (v) electrical breakdown (EB) issues; (vi) degradation or failure of specific network equipment; and (vii) damage to or faults in international submarine cables. (vii) multiple fiber cuts by external agencies which commonly happen due to infrastructure activities. Also, in case wireless backhaul (microwave/ E band etc), the same could be impacted by external interference, jammers etc. In such circumstances, TSPs may be required to divert the traffic of affected customers through alternate channels or routes to ensure continuity and availability of services. However, such traffic diversion may result in some degradation in speed and other performance parameters. This is primarily because alternate routes may already be optimally utilised or may have limited available capacity, and therefore TSPs cannot always ensure the same level of service performance that would otherwise be available through the primary route. In such situations, the primary objective of the TSP is to ensure continued availability and continuity of services, even if there is a marginal and temporary degradation in certain performance parameters. TSPs nevertheless make their best efforts to restore the affected network and provide the prescribed speed and service quality to subscribers at the earliest possible opportunity. In view of the above, while TSPs endeavour to provide the prescribed speed to subscribers at all times, mandating and expecting compliance with a 100% benchmark at all times is not operationally feasible, particularly in

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				circumstances where the relevant factors are beyond the reasonable control of TSPs. Accordingly, we request the Authority to kindly reconsider the proposal to mandate 100% benchmarks for parameters in respect of which TSPs do not have 100% control at all times. However, if the Authority is of the view that such parameters should be retained, we submit that they should, at most, be treated as monitoring parameters with realistic and technically achievable benchmarks, rather than as mandatory compliance requirements with a 100% benchmark.
8	Para 6.b (Sub-regulation 9.1.x)	Mean Time-To-Repair (MTTR) (Benchmark: ≤ 10 hours)	Prescribed benchmarks inconsistent with the time limits for fault resolution as prescribed for fault repair parameters	The Authority has introduced the parameter of MTTR, with a benchmark of ≤ 10 hours for all resolved complaints for broadband services, in addition to the existing fault-repair parameters, under which 85% of faults are required to be resolved by the next working day and 99% within three working days. Further, the measurement and reporting of both MTTR and fault-repair performance do not, in principle, provide an assessment of service quality from distinct perspectives, as both parameters essentially measure the timeliness of fault restoration. Moreover, the prescribed MTTR benchmark of less than 10 hours appears to be inconsistent with, and considerably more stringent than, the maximum permissible resolution timelines already prescribed under the fault-repair parameters. In practical terms, a TSP may fully meet the existing fault-repair benchmarks and yet fail to meet the prescribed MTTR benchmark. The issue is illustrated below. For instance, consider 100 faults during a reporting period. In order to meet the prescribed fault-repair benchmarks, at least 85 faults would need to be

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				resolved by the next working day, at least another 14 faults within three working days, while up to 1 fault may get resolved beyond the prescribed three-working-day timeframe. If, for the purpose of illustration, the maximum permissible time for resolving a fault by the next working day is considered as 8 working hours, and the faults falling within the 14% category are resolved within 24 hours, while the remaining 1% of faults are resolved within 72 hours, the resulting MTTR would be: MTTR = [(85 × 8) + (14 × 24) + (1 × 72)] / 100 = 10.88 hours Thus, even when the TSP fully complies with the prescribed fault-repair benchmarks, the resulting MTTR may exceed the prescribed benchmark of less than 10 hours. This demonstrates that the MTTR parameter, in its present form, not only substantially overlaps with the existing fault-repair parameters but also introduces a considerably more stringent requirement than the maximum permissible resolution timelines prescribed under those parameters. Consequently, a TSP may be fully compliant with the fault-repair benchmarks and yet be treated as non-compliant with the MTTR benchmark. This creates an apparent inconsistency between two parameters intended to measure the same underlying aspect of service quality, i.e., timely restoration of faults. It is also pertinent to recognise the operational challenges faced by TSPs in meeting the existing fault-repair benchmarks. Fault restoration may involve

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				circumstances that require substantially longer resolution times, including factors that are either outside the direct control of the TSP or cannot reasonably be addressed within a fixed short timeframe. Such circumstances may include cable cuts or damage, underground cable faults, joint failures, faults requiring excavation or other civil works, requirement of access to customer premises, non-availability of customers, shortage or non-availability of spares, repeated visits, rescheduling of visits, customer end permissions, extreme weather conditions, and other site-specific or infrastructure-related constraints. In such circumstances, even a relatively small proportion of complex or long-duration faults (1-15%) can materially increase the overall MTTR. Accordingly, prescribing an MTTR benchmark of less than 10 hours, in addition to the existing 85% within next-working-day and 99% within three-working-day fault-repair benchmarks, may result in a disproportionately stringent requirement and may not appropriately reflect the operational realities of broadband fault restoration. In view of the above, it is requested that the Authority may consider not introducing MTTR as a separate mandatory QoS parameter, as it substantially overlaps with the existing fault-repair parameters and may result in an additional and potentially conflicting compliance requirement. Alternatively, if the Authority still considers it necessary to retain MTTR as a performance indicator with due recognition to the practical and operational realities of fault restoration, it is requested that:

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				1. The MTTR benchmark may be appropriately aligned with the maximum permissible resolution timelines prescribed under the existing fault-repair parameters, so that compliance with the prescribed fault-repair benchmarks does not simultaneously result in non-compliance with the MTTR benchmark. 2. MTTR may be retained as a monitoring/performance indicator rather than a mandatory QoS parameter carrying financial disincentives. This would enable the Authority to monitor the overall efficiency of fault restoration without creating a situation where a TSP may be subjected to an additional financial disincentive despite having complied with the prescribed fault-repair benchmarks. 3. In particular, MTTR should not result in double financial disincentives for substantially the same underlying service issue, wherein a TSP is penalised for non-compliance with the fault-repair benchmark and is again subjected to a financial disincentive under the MTTR parameter.
9	Para 6.b (Sub-regulation 9.1.xi)	Percentage of significant network outage reported to the Authority within 24 hrs of start of the outage Note: Significant Network Outage is defined as an event where broadband (wireline) service in a district remains unavailable for a continuous period exceeding four	Proposed SNO parameter should ideally not form part of mandatory QoS compliance reporting with associated financial disincentives or rental rebates. Further, it is suggested that inclusion	While the Authority has introduced the proposed SNO parameter in line with the QoS framework for Access (Wireless) services, it is submitted that imposing stringent benchmarks with financial disincentives and rental rebates have already discouraged TSPs from expanding networks in rural, remote and geographically challenging areas. The proposed SNO definition, covering an outage affecting more than 10% of subscribers or a 20% or more reduction in speed (material degrade), may be triggered even by relatively small or localised incidents. In wireline broadband

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		(4) hours, or where more than ten percent (10%) of subscribers in the Service Area experience complete loss of service or material degradation in service quality for a continuous period exceeding four (4) hours. Material degradation in service quality shall mean a reduction of twenty percent (20%) or more in the download or upload speed experienced by a subscriber vis-à-vis the declared typical download or upload speed.	of material degrade under the definition of SNO also needs to be removed.	networks, particularly where fibre backhaul has limited geographic availability and subscriber bases are small, a fibre cut or equipment fault affecting a limited number of subscribers could nevertheless exceed the 10% threshold without reflecting the actual scale of the incident. Further, restoration of fibre networks may be impacted by circumstances beyond the reasonable control of TSPs, including local public issues, catastrophic weather, access and last-mile connectivity issues, electrical breakdowns, equipment failures and submarine cable faults. In such circumstances, TSPs may be required to divert the traffic of affected customers through alternate channels or routes to ensure continuity and availability of services. While such traffic diversion is undertaken with the primary objective of maintaining service continuity, it may result in some temporary degradation in speed or other performance parameters. This is primarily because alternate routes may already be optimally utilised or may have limited available capacity. Consequently, even where the TSP has taken reasonable measures to maintain service continuity, the resulting temporary degradation could independently trigger the proposed SNO criteria under material degradation. With regard to rental rebates, TSPs are already subject to fault-repair benchmarks and applicable rebates for delayed restoration. An additional SNO-linked rebate would therefore result in duplication of compensation for the same underlying service disruption and should not be imposed. Accordingly, we submit that the SNO parameter should ideally not form part of mandatory QoS compliance reporting with financial disincentives or rental

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				rebates. Alternatively, if retained for monitoring network resilience and service availability, it should be treated strictly as a monitoring parameter, without financial disincentives or mandatory rebates, and with appropriate exclusions/relaxations for circumstances beyond the reasonable control of TSPs and for difficult and remote areas.
10	Para 6.c (Sub-regulation 9)	In the explanation under sub-regulation (2), the words “fixed wireless and” shall be deleted. and Explanation: For the purposes of this regulation, broadband (wireline) service shall include all fixed wireless and wireline medium including copper, fibre, cables etc.	It is recommended that Fixed Wireless Services should not be excluded from Wireline services	We submit that the exclusion of Fixed Wireless Access (FWA) services from the scope of Broadband (Wireline) services is not only technically incorrect but also inconsistent with the principles, standards and international precedents established by the International Telecommunication Union (ITU), which have, in principle, always been followed by the Authority while framing its regulatory guidelines and prescribing the governing framework for telecommunication services. More importantly, the QoS framework, operational performance KPIs and measurement methodologies prescribed by the Authority are, to a significant extent, aligned with the standards and measurement methodologies prescribed by the ITU. In this context, the proposed exclusion of FWA services from the Wireline Broadband category represents a divergence from the applicable international standards and established methodologies, particularly when FWA services are recognised within the framework of fixed broadband services. We submit that such exclusion should be supported by a clear technical and regulatory rationale, which does not appear to have been provided by the Authority. We further wish to bring to the Authority's attention that RJIL has, on several occasions in the past, made detailed representations on this subject, setting

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				out the technical justification, international precedents and relevant ITU standards demonstrating that FWA services, by virtue of their network design and architecture, are functionally equivalent to wireline broadband services for the purposes of QoS assessment. Further, based on the request from Authority, RJIL has also provided a live demonstration of the technical architecture of FWA services to the Authority during its visit, thereby enabling the Authority to examine and understand the underlying network design and operational architecture. It is pertinent to note that, apart from the network design and architecture, FWA services are designed, engineered and deployed on the same fundamental principles using network architecture as deployed for wireline broadband services. This includes the utilisation of common core network elements and other network equipment for the provision and management of broadband services. Further, FWA services are provided using a fixed-line number series/resource, which further demonstrates their fixed-service characteristics inline with the wireline services. Further, such exclusion of FWA services from the Wireline Broadband category supported by substantially similar core network architecture, engineering principles and operational processes may not be practically feasible for TSPs to segregate or exclude the performance of FWA services from the KPIs prescribed for Wireline Broadband services, particularly where common network infrastructure, core network elements and operational systems are utilised for both services. Such an approach may consequently

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				result in inconsistencies, error and wrong reporting in QoS measurement, reporting and compliance. In view of the above, and in continuation of our earlier submissions to the Authority on this subject, we respectfully request the Authority to reconsider the proposed exclusion of FWA services from Wireline Broadband services. We submit that FWA Broadband services should be continue to be considered under the 'Fixed Wireline' category for all regulatory, QoS measurement, compliance and reporting purposes, consistent with the underlying technical architecture, applicable international standards and established regulatory principles.
11	Para 7.a (Sub-regulation 10.1.ii)	Resolution of billing/ charging complaints within four weeks one week	It is recommended resolution time period of 4 weeks should not be reduced to 1 week	It is submitted that the existing framework requires 100% of billing/charging complaints to be resolved within four weeks, with any consequential credit, waiver or adjustment to be made within one week of resolution. This provides both a defined outer limit for resolution and a separate timeline for giving effect to the financial adjustment. Reducing the resolution timeline from four weeks to one week may prioritise speed over the accuracy, completeness and correctness of resolution. Billing/charging complaints can range from simple clarifications to complex disputes involving usage records, international roaming, payment gateways, refunds, tariff applicability and bundled services. Such complaints may require reconciliation across multiple systems and validation of information from roaming partners, carriers, aggregators or other third parties, which may not always be within the TSP's direct control.

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				In particular, complaints relating to international roaming and usage-based charging may require detailed investigation and validation before a final determination can be made. Resolution of such complaints may involve reconciliation across multiple systems, examination of network usage records, charging and billing records, and validation of information or inputs received from international roaming partners, aggregators or other interconnected entities. Prescribing an unduly short resolution timeline may therefore compromise the accuracy and completeness of the investigation, particularly where the complaint involves a financial dispute with direct monetary implications for the customer. Premature credit, waiver or reversal without completing the necessary verification could result in incorrect financial adjustments, subsequent corrections and further disputes, which would ultimately not be in the interest of consumers. Moreover, billing/charging disputes which involves roaming partners, international carriers, payment gateways, aggregators or other third parties. The resolution of such complaints may consequently depend, to some extent, upon information, confirmation or action from entities beyond the TSP's direct operational control. An unduly short timeline could therefore result in premature or inaccurate financial adjustments, subsequent corrections and further disputes, which would not be in the consumer's interest. The existing requirement for 100% resolution within four weeks already provides consumers with a clear and definite regulatory timeline.

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				Accordingly, the regulatory framework should focus not merely on faster closure, but on correct, transparent and final resolution of complaints. It is therefore requested that the existing four-week resolution timeline be retained , particularly for complex billing/charging complaints, as a reasonable and balanced timeframe for proper investigation and accurate resolution.
12	Para 7.b (Sub-regulation 10.1)	Following proviso to the sub-regulation (1) shall be deleted - Provided that the service provider providing both access service (wireline) and broadband (wireline) service shall meet the benchmarks for both the services on aggregated basis.	It is recommended that separate reporting of QoS KPIs for Access (Wireline) and Broadband (Wireline) should not be mandated, particularly for TSPs offering these services as a convergent offering.	It is submitted that, while framing the QoS Regulation, 2024, the Authority had, after considering stakeholder submissions, adopted the objective of simplifying the QoS framework and keeping it light-touch. Accordingly, as one of the measure, service providers offering both Access Service (Wireline) and Broadband (Wireline) services were permitted to meet customer-service QoS benchmarks on an aggregated basis. The proposed segregation of QoS compliance for the two services would depart from this framework and result in significant duplication of reporting, PMR audits, compliance processes, financial disincentives, rental rebates and other regulatory obligations. It would also require substantial operational and system changes for segregating KPIs, performance metrics and reporting. This would be particularly burdensome for TSPs offering wireline voice and broadband as a convergent service, where data is the primary service and voice is provided as an unlimited and complimentary bundled service. Further, TSPs such as RJIL do not offer standalone FTTx-based wireline voice services to retail customers. Separate QoS measurement and reporting in such circumstances would therefore add regulatory complexity

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				without corresponding benefit and may also result in duplicate development efforts and financial consequences for the same underlying customer/service. Accordingly, we request the Authority to reconsider the proposed segregation and retain aggregated QoS reporting for genuinely convergent services. Alternatively, TSPs may be permitted to report QoS either on an aggregated or service-specific basis, subject to declaration by the TSP, as follows: 1. Aggregated reporting may apply where wireline voice and broadband/data are provided through a common connection/line, under common KYC and charging arrangements, or where one service is complimentary/bundled with the other. 2. Service-specific reporting may apply where the services are provided through separate technical arrangements, under separate KYC, or are separately charged. This will help in creating distinction between genuinely convergent service offerings and independently provisioned services, while retaining the Authority's ability to monitor QoS performance effectively. It would also avoid unnecessary duplication of reporting, audits and financial consequences and maintaining effective QoS monitoring consistent with the Authority's objective of a simplified and light-touch regulatory framework, as envisaged under the QoS Regulation, 2024.
13	Para 8.a (Sub-regulation 15.1.e)	Service wise Quality of Experience Score (QoES) of service providers based on various parameters of network performance, consumer	It is submitted that QoES should not be mandated without first providing the fundamental details	In view of the Authority's proposal to introduce and publish a service-wise Quality of Experience Score (QoES) , it is submitted that, as this mechanism is being introduced for the first time, the Authority may first share the complete QoES methodology and framework with TSPs, including the

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		service, and consumer perception collected through multiple sources	of its methodology and framework for consultation. Further, it is suggested that QoES should preferably be based on an independently measured, crowdsourced and device/app-based QoE framework, with measurement undertaken by the Authority, rather than relying primarily on TSP-reported QoS data.	parameters, data sources, measurement and computation methodology, aggregation and weighting methodology, validation process, and publication framework, for detailed consultation. At present, there is apprehension that a high-level, service-wise QoES may not, by itself, be an appropriate or sufficiently representative measure of customer experience, particularly if it seeks to consolidate multiple dimensions of performance into a single aggregated score. In the absence of clarity on the fundamental aspects of the proposed framework, introducing QoES as a mandatory regulatory requirement would be premature. In particular, the absence of a clearly defined methodology for assigning relative weights to network performance, service quality, consumer service and consumer perception parameters within a single QoES could introduce an element of subjectivity and may result in inconsistent interpretations of service quality across service providers. A composite score may also oversimplify the complex and multidimensional nature of customer experience. Accordingly, a separate and detailed consultation may be undertaken to assess the technical feasibility, data requirements, implementation challenges and regulatory implications of the proposed QoES framework. It is further submitted that individual KPIs relating to network performance, service quality and customer service provide a more transparent and actionable view of specific aspects of customer experience. Aggregating multiple parameters into a single score may mask deficiencies in individual areas, as poor performance in one parameter could potentially be offset by

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				better performance in another, thereby reducing the visibility of issues requiring corrective action. From the perspective of regulatory oversight and consumer awareness, monitoring and publishing relevant individual KPIs may therefore provide greater transparency and actionable information than a single composite score. Further, QoE is fundamentally customer-centric and cannot necessarily be adequately represented through TSP-reported network QoS parameters alone. As submitted earlier in response to the Consultation Paper on QoS Regulation, 2023, wherein the Authority had envisaged moving beyond the measurement of Quality of Service (QoS) towards achieving better Quality of Experience (QoE), we reiterate that the Authority may consider an independently measured, crowdsourced and device/app-based QoE framework, consistent with evolving approaches to measuring actual end-user experience, rather than introducing another layer of mandatory reporting based primarily on TSP-reported parameters. The proposed QoES, if based primarily on existing TSP-reported QoS data, may also be inconsistent with the objectives of Ease of Doing Business, regulatory simplification and a light-touch regulatory framework, as it could result in additional reporting, data reconciliation, validation and compliance requirements without necessarily providing a materially distinct assessment of customer experience. Accordingly, it is respectfully requested that:

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				1. The complete QoES methodology and framework may be shared with TSPs and subjected to a separate and detailed consultation before any implementation or publication of QoES. 2. The Authority may consider an independent, crowdsourced and device/app-based QoE measurement framework for assessing actual end-user experience, rather than relying solely on TSP-reported QoS parameters. 3. QoES should not create an additional layer of mandatory reporting. If QoES is introduced, the same may be accompanied by appropriate rationalisation of the existing QoS measurement and reporting requirements to avoid duplication, minimise compliance and reporting burdens, and enable TSPs to focus resources on improving network and service quality.
14	Para 10.a (Sub-regulation 16A)	Explanation: If, upon examination of the information in the compliance report or in any other report pertaining to the performance of QoS parameters furnished by the service provider, the Authority finds that there is a mismatch in the data or value of any parameter reported by the service provider and the performance calculated by the Authority from value or the data	It is suggested that sub-regulation 16A be limited to deliberate or material false reporting and not cover marginal mismatches or clerical/computational errors. Alternatively, the permissible deviation may be increased from 1% to 10%, particularly as most QoS	With reference to the Authority's explanation that, "<i>if, upon examination of the information in the compliance report or in any other report pertaining to the performance of QoS parameters furnished by the service provider...</i>", do Authority intends to compare compliance reports submitted by TSPs to various divisions of TRAI with the data submitted under the QoS reporting framework and impose financial disincentives in case of any discrepancy, it is submitted that such comparison may not be appropriate or meaningful. TSPs furnish information to different divisions of TRAI based on specific regulatory requirements, formats, definitions, reporting periods and purposes prescribed for each respective framework. Accordingly, information submitted under different regulatory mechanisms may not necessarily be

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		given by the service provider in its report or observed during the audit, to the extent that absolute value of difference exceeds 1% of the prescribed benchmark, then such events shall also be considered as false reporting.	benchmarks are themselves in the 1-2% range.	comparable on a like-to-like basis, and any apparent variation should not, by itself, be construed as non-compliance or warrant financial disincentives. If the Authority has concerns regarding consistency or duplication of information submitted by TSPs, it is suggested that the Authority may consider establishing a unified and centralised reporting mechanism, whereby TSPs submit the requisite information only once through a common platform and the same centrally submitted data may be accessed and utilised by different divisions of TRAI, as required. This would avoid duplication of reporting, eliminate inconsistencies arising from different reporting requirements, and reduce unnecessary compliance burden on TSPs. Accordingly, the proposed provision for cross-comparison of information submitted under different regulatory frameworks and imposition of financial disincentives based merely on any identified variance may kindly be reconsidered and suitably modified. Further, while we welcome the Authority's initiative to distinguish between material/deliberate false reporting and inadvertent clerical or computational errors, it is suggested that sub-regulation 16A should apply only to deliberate or material false reporting resulting in non-compliance with the prescribed QoS benchmarks. Marginal discrepancies arising from data mismatches, clerical or computational errors resulting in non-compliance to prescribed benchmark, particularly where the underlying/base data submitted to the Authority is correct and no error is identified therein, should not be treated as false reporting.

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				This is particularly relevant as the QoS framework has migrated from mobile tower-level to cell-level monitoring and reporting, with base data being submitted through automated/API-based mechanisms. In the case of RJIL alone, reporting involves data relating to more than 55 lakh cells, requiring integration, processing, computation and validation across multiple source systems. While every endeavour is made to ensure accurate and complete reporting, the possibility of an exceptional variation due to unforeseen programming errors, technical glitches or inadvertent errors cannot be entirely ruled out. Where the underlying data has been duly submitted and is available with the Authority for verification, such inadvertent computational discrepancies should not be treated as false reporting. Alternatively, if the Authority is of a divergent view, it is suggested that the permissible deviation for treating such mismatch, clerical or computational errors as false reporting may be increased from 1% to 10% not resulting in non-compliance to the prescribed QoS benchmarks, particularly since the prescribed benchmarks for most QoS parameters are themselves in the range of 1–2%, making a 1% deviation disproportionately negligible/stringent.
15	Para 14.c (Schedule-I 3.2.2)	Service providers shall ensure that complaint registration facilities remain accessible to subscribers at all times, including during network-wide or localized service disruptions. In case of such disruptions, all affected subscribers shall be either	It is submitted that it is not technically and operationally feasible to identify the affected subscriber along with mapping with system-generated fault especially in case of	It is submitted that the proposed requirement may not be technically and operationally feasible, particularly for Access (Wireless) Services , as network outages are generally identified at the cell/site/network-element level and it may not be possible to accurately identify and map every affected subscriber to a specific system-generated fault ticket which is preliminary meant for operations team for early resolution only.

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		enabled to register complaints or be automatically mapped to system-generated fault tickets. Such instances shall be duly recorded and included in Quality of Service reporting metrics.	Access Wireless Services.	The impact of a wireless outage may vary based on subscriber location, mobility, serving cell, handover to alternate cell, coverage, traffic conditions and availability of alternate cells. Subscribers may also experience intermittent degradation or continue receiving services through alternate network elements. Accordingly, any attempt of real-time subscriber-level mapping may result in duplicate, inaccurate or inflated fault records and require significant system integration and processing. Similarly, in wireline networks, particularly in cases of fibre cuts or core equipment faults or submarine cable faults, TSPs may restore services through alternate routes/channels to minimise customer impact. While such restoration efforts may ensure continuity, they may temporarily result in minor degradation in service quality. Automatically mapping all such instances to individual subscriber fault tickets may create unnecessary confusion for customers and additional operational burden for TSPs, despite their efforts to restore services. In view of the above, and considering that the existing QoS framework already provides for reporting of network outages and service disruptions to the Authority, it is requested that the proposed requirement should not be mandated, particularly where the same incidents are already captured through the existing QoS reporting framework.
16	Para 14.i (Schedule-I 5.3)	However, in cases where frequency hopping phenomenon is used in GSM network, GSM voice samples with Rx Qual	We request the Authority to adopt a fair, transparent and technology-neutral	It is submitted that, while the Authority has considered the requests of 2G service providers and enhanced the Rx Qual threshold, the submissions of TSPs offering 4G/5G services regarding the SNIR threshold have not been similarly considered. Despite repeated representations and on-field

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		between 0 to 5 may be considered as good voice quality, while maintaining supporting evidence	approach by either providing justification for not considering the repeated 4G/5G submissions on SNIR ≤ -6 dB or considering the same on merits, consistent with the approach adopted for 2G services.	demonstrations by TSPs supporting consideration of an SNIR value of < -6 dB , the request appears to have been set aside without providing specific justification. We therefore once again request the Authority to reconsider the submission and adopt a fair, transparent and technology-neutral approach , either by providing the rationale for not accepting the proposed SNIR threshold or by considering the same appropriately, in line with the approach adopted for 2G services, without discrimination between technologies or service providers.
17	Para 14.i (Schedule-I 8)	After para 7.1.7, following para shall be inserted – Modification in the Schedule: In view of technological advancement, the details mentioned in the schedule can be modified by the Authority through direction or order.	It is strongly recommended this clause should be removed.	It is submitted that the proposed provision permitting the Authority to modify the Schedule through directions or orders, particularly on account of technological advancements, is inconsistent with the principles of fair, transparency, consultation and due regulatory process underlying the TRAI Act. Such an enabling provision would confer broad and unilateral powers upon the Authority to modify substantive regulatory requirements without providing stakeholders an adequate opportunity to examine and make representations on the proposed changes. Technological developments and their implications for QoS parameters, measurement methodologies and compliance requirements require detailed technical and regulatory consideration before altering, changing or imposing any new obligation on TSPs. Allowing such changes to be introduced through directions or orders, without a formal consultation process, may also create regulatory uncertainty and undermine the established consultative framework.

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				Accordingly, it is requested that any modification to the Schedule or QoS requirements should be undertaken only through the prescribed regulatory/consultative process , with adequate opportunity for stakeholders to provide their views, rather than through unilateral directions or orders of the Authority.
18	Para 15. (Schedule-III)	Schedule-III Broad guidelines for publication of service wise geospatial coverage map by service providers on their website.	It is recommended that the Authority should not deviate from its stated objective of simplifying the QoS regulatory framework and maintaining a light-touch regulatory approach , and should avoid micromanaging technical and operational aspects of QoS. Further, the proposed provisions under Schedule-III , which are technically and operationally unfeasible and neither recommended by any regulator nor followed as	It is recommended that the Authority should not deviate from its stated objective of simplifying the QoS regulatory framework and maintaining a light-touch regulatory approach and should avoid micromanagement by prescribing overly detailed and technically and operationally complex modalities for service coverage maps. The existing guidelines issued vide Direction dated 22.11.2024 , though themselves prescriptive in nature, have been duly complied with by TSPs and should, therefore, be considered sufficient for the subject matter. Accordingly, the proposed amendments, which are not only operationally unfeasible and but impractical as well, may kindly be reconsidered and withdrawn. It is further submitted that the Authority had previously proposed several of the changes now contained in the draft amendment, in response to which TSPs, including RJIL , had submitted detailed justifications highlighting the associated technical, operational and implementation complexities vide letter dated 19.02.2026 . It was respectfully submitted that such operationally unfeasible and prescriptive modalities should not be mandated. However, despite the submissions made by the TSPs, and without, to our understanding, addressing or providing any specific justification in response to the concerns raised, the Authority has proceeded to incorporate the said proposals in the

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			standard industry practice globally, if enforced, may impose significant financial and operational burdens on TSPs without delivering any commensurate consumer or regulatory benefit.	draft amendment and has, in several respects, further tightened and expanded the prescriptive requirements. In particular, the proposed requirements under Schedule-III relating to signal-strength thresholds for Excellent/Good/Fair/No Coverage, 98% accuracy for RF prediction models or data drive / Virtual Drive test (VDT) methodology - based coverage maps, mandatory self-validation, compliance with relevant OGC standards, updating theoretical maps based on actual service experience/audit samples, and financial disincentives for deviations appear technically and operationally disproportionate and unduly prescriptive. Such requirements are neither prescribed by the ITU nor, to our knowledge, supported by comparable international regulatory precedent. These obligations, particularly for an indicative tool intended to facilitate informed consumer choice, may impose significant operational complexity without commensurate regulatory benefit and should therefore be reconsidered. In this regard, the relevant clarification provided by the Authority is reproduced below: <i>‘The coverage maps are meant to provide network coverage related information to the consumers. The coverage maps are representative maps in given conditions and are not directly linked to network performance which depends upon several factors including consumer’s location, number of consumers latched in the cell, load on the website/ application being accessed etc. The performance of the network shall be monitored as per other QoS parameters prescribed for wireless access service.’</i>

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				Further, our detailed inputs on the various provisions under Schedule-III, relating to the preparation, display, periodic updating, validation, imposition of financial disincentives, sharing of published coverage maps with TRAI, etc., are set out below: 1. Defined signal strength thresholds to classify coverage as Excellent, Good, Fair, or No Coverage: It is submitted that the proposed RSRP thresholds for 4G and 5G technologies for depicting coverage as “Excellent,” “Good,” “Fair” and “No Coverage” are excessively stringent and technically inappropriate and lack any established international precedence or basis in applicable 3GPP/ITU standards. Further, to the extent that RSRP < -110 dBm is proposed to be classified as “No Coverage,” such a threshold is not prescribed by either 3GPP TS 36.214 for LTE or 3GPP TS 38.215 for 5G NR as a universal boundary between coverage and no coverage. Further, the 3GPP NR measurement framework provides for measurement and reporting of SS-RSRP over a substantially wider range, with the specified L3 reporting range extending from -156 dBm to -31 dBm, with 1 dB resolution. This further demonstrates that -110 dBm is neither a fundamental radio limit nor a 3GPP-defined coverage boundary. Accordingly, the proposed classification of > -85 dBm as “Excellent,” -85 to -100 dBm as “Good,” -100 to -110 dBm as “Fair,” and < -110 dBm as “No Coverage” should not be adopted as a universal methodology for generating coverage maps. These thresholds lack established international

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				or standards-based precedence and are excessively stringent. In particular, the sharp transition from “Fair” to “No Coverage” at –110 dBm may result in areas with usable network service being incorrectly represented as coverage holes. From a network-planning perspective, acceptable and usable 4G/5G services can be achieved at RSRP levels as low as approximately –118 dBm, depending on the relevant deployment and radio conditions. • Today’s networks deliver superior service quality even at much lower RSRP levels thanks to smarter radio technologies and advanced signal processing. • Dynamic scheduling, adaptive modulation, and advanced error-correction techniques ensure continuity of service even when the signal strength weakens. Accordingly, it is respectfully requested that TRAI refrain from prescribing such fixed thresholds, and particularly from treating RSRP < –110 dBm as an automatic “No Coverage” criterion. An RSRP level of > –110 dBm is itself recognised as excellent coverage by the Department of Telecommunications (DoT), with the same threshold prescribed for compliance with minimum roll-out obligations for wireless service providers. Treating RSRP levels below –110 dBm as “No Coverage” would therefore be inconsistent with the existing regulatory treatment and may result in undue hardship to TSPs, as well as an inaccurate and misleading representation of their actual network coverage footprint.

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				Any RSRP-based coverage methodology should instead be evidence-based and technology- and deployment-sensitive, taking into account propagation conditions, network configuration, technology and actual service availability. Any prescribed thresholds should be supported by empirical field measurements and demonstrated correlation with real-world network performance. Accordingly, it is recommended that the “No Coverage” category should not commence as high as –110 dBm. As an engineering basis for further consideration, the following indicative categorisation may be considered for 4G/5G networks: • –110 dBm: Excellent • –110 dBm to –118 dBm: Fair • –118 dBm to –128 dBm: Average • < –128 dBm: No Coverage Alternatively, TRAI may adopt data driven analysis as explained in Annexure 1 2. Service provider must ensure that the accuracy of published coverage map should be equal to or better than 98% as prescribed in sub-regulation (1) of regulation 6. Further, service provider shall undertake self-validation of its coverage map to ensure accuracy of the published coverage information. Please refer our inputs under Para 4.a (Sub-regulation 6.1.i).

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				3. By default, combined coverage map, covering all available technologies in the areas, will be displayed on service provider website. While displaying combined coverage map, signal strength of any technology better than prescribed threshold for 'No coverage' for that technology may be considered for displaying as covered. Further, the preference shall be given to higher generation technology in combined coverage map. For example, if in any area, coverage (better than prescribed threshold limit for 'No coverage') of all technologies i.e. 2G, 3G, 4G and 5G is available, then in combined coverage map, the area will be shown as covered with 5G. The current proposal from TRAI seems to be erroneous as the proposed default combined coverage map, which treats coverage from any technology above the prescribed "No Coverage" threshold as "covered" and represents the area using the highest-generation technology available, may result in an inaccurate or potentially misleading representation of the actual network capabilities available to consumers. While a combined coverage map may be useful for indicating the overall availability of mobile services, coverage across different generations of technology cannot be treated as equivalent from a consumer or competitive perspective. For instance, an area having only 2G coverage and an area having 5G coverage may both be classified as "covered", despite representing substantially different levels of network capability, speed and service experience.

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				Such representation may also fail to adequately reflect the competitive differentiation arising from substantial investments made by TSPs in deploying higher-generation technologies such as 4G and 5G. If technology-specific differences are not apparent in the default map, consumers may not be able to make an informed comparison of the network capabilities of different TSPs, which we believe is the whole objective of displaying coverage maps. It may also adversely affect incentives for continued investment in higher-generation network deployment. Accordingly, it is requested that TRAI should retain technology-specific differentiation in the default coverage representation as is currently defined under existing QoS Regulation 2024 wherein the combined map may clearly indicate all the technology available at each location through distinct colours, together with prominent and easily accessible technology-specific maps for 2G, 4G and 5G, rather than displaying all qualifying coverage simply as “covered”. Thereby providing meeting TRAI’s objective of consumer transparency, informed choice, fair competition and a level playing field among TSPs. 4. To ensure adequate visibility and ease of access for users, a tab namely ‘Service Quality’ shall be created in the top navigation bar on ‘Home’ or landing page of the service providers’ website. In this regard, it is submitted that RJIL’s top navigation bar is designed primarily to direct users to its various service categories, including wireless (mobile) services, with service-specific information made

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				available upon navigating to the relevant service page. Mandating placement of a “Service Quality” tab in the top navigation bar due to space constraints will create substantial changes in business related specifications, due to existing space constraints and would unnecessarily interfere with the established website architecture and customer-facing design, amounting to regulatory micromanagement of business and communication channels. It is pertinent to note that both top and bottom menus constitute navigation bars under standard web-design practices. Accordingly, the “Coverage Map” is appropriately placed in the bottom navigation bar of the landing page, consistent with established conventions of placing regulatory and compliance-related information in the footer. RJIL has followed this practice since inception, ensuring customer familiarity, ease of access and adequate visibility. 5. Process for validation, determining the accuracy of coverage and subsequent financial disincentives: In view of our submissions regarding the measurement and maintenance of accuracy and considering the inherent radio propagation and environmental conditions affecting wireless networks, we reiterate that RF prediction models or data drive / Virtual Drive test (VDT) based methodology maps are intended only to depict theoretical and indicative coverage. Accordingly, prescribing a specific level of accuracy and subjecting such maps to subsequent validation is neither technically feasible nor reasonable. Any difference between theoretical depiction

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				and actual customer experience is inherent to the nature of wireless networks and is bound to occur due to varying radio and propagation conditions. Consequently, imposing financial disincentives for such deviations would be unjustified and may unfairly place the burden on TSPs. The proposed accuracy, validation and corresponding financial disincentive requirements should therefore be withdrawn. 6. In addition, for areas where coverage is depicted as better than actual, as identified through consumer feedback or during the Authority's validation, the service provider shall highlight such area distinctly in an amber colour with hexagonal grid of circumradius (center to vertex) of 30 meter and continue to display such marking until the actual network performance aligns with the published coverage. It is submitted that while service-related customer feedback, including coverage-related feedback, is duly considered by RJIL for network enhancement, updation and appropriate corrective measures, the requirement to validate all real-time network experience samples received from customers or shared by the Authority during IDT or other exercises, compare the same with theoretical coverage maps, and correspondingly update the published maps is neither technically nor operationally feasible. Further, the proposed requirement to distinctly mark such areas in amber colour using a 30-metre circumradius hexagonal grid and retain such marking until actual network performance aligns with the published

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				coverage is disproportionate and impractical, considering the dynamic nature of wireless networks and inherent variations in radio propagation and customer experience. RJIL therefore reiterates that coverage maps are theoretical and indicative in nature and cannot reasonably be expected to continuously reflect the large volume of real-time customer experiences. Accordingly, the proposed requirements relating to validation, mapping, updation and such distinct marking may kindly be withdrawn. It is therefore submitted that the Authority should prescribe only the broad objectives and principles for transparent and consumer-friendly coverage information, while leaving the technical methodology, used tools and processes, validation mechanisms and data formats to TSPs, subject to reasonable accuracy and disclosure requirements. This would provide the necessary flexibility to adopt technology-neutral and internationally accepted practices without unnecessarily micromanaging network-planning and engineering processes. Further, if enforced in their present form, the proposed requirements may impose will only end up non-compliance thereby imposing financial disincentives, significant financial, technical and operational burdens on TSPs, including system development, data processing, field validation, periodic updation and ongoing maintenance, without commensurate consumer or regulatory benefits. Accordingly, the detailed prescriptive requirements under Schedule-III may kindly be reconsidered and withdrawn,

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				in keeping with the Authority's stated objective of maintaining a simplified, proportionate and light-touch QoS regulatory framework.

A. Alternative proposed methodology:

Rather than relying solely on an RSRP-based methodology, we propose a comprehensive, **data-driven approach** that evaluates mobile coverage based on **actual customer experience and real-world network performance**.

A data-driven, end-to-end methodology that combines network health, performance, user experience, device capability, consumption patterns, and RF coverage/quality to accurately assess city/village-level coverage.

The key features of the proposed methodology are as follows:

1. **Assessment based on actual customer experience:** The proposed methodology uses real customer experience data to assess the availability and effectiveness of mobile network coverage within each city/village, thereby providing a more representative view of actual network availability. MDT feature if supported mandatorily by devices helps in lat/long reporting which improves the accuracy of data driven analysis.
2. **Pan-India collection of subscriber-level network data:** Log Summary Records (LSRs) comprising 3GPP-defined trace-port events are collected from active subscribers across India over a representative period of seven consecutive days every quarter. These records capture actual network interactions and service experience of users.
3. **Precise spatial mapping of customer experience:** Subscriber activity is spatially mapped onto standardized Geohash#7 grids (~150 m × 150 m), enabling granular and consistent geographic assessment of network availability.
4. **City / Village-level geographical delineation:** The inhabited area of each village is mapped onto the corresponding standardized Geohash#7 grids, thereby establishing a well-defined geographical basis for assessing coverage within the city / village.
5. **Coverage classification based on customer-experience thresholds:** City / Village coverage is determined by using defined customer-experience-based thresholds, rather than relying solely on signal-strength parameters such as RSRP. This enables the methodology to reflect actual on-ground network availability and service experience more realistically.
6. **Generation of Coverage Maps:** Based on the above comprehensive methodology, coverage maps will be generated. The resulting maps will provide a more representative and data-driven view of actual coverage and service experience.

In essence, the proposed methodology shifts the **assessment from a signal-strength-centric approach** to an **evidence-based assessment of actual network availability and customer experience**, thereby providing a more meaningful measure of coverage.

Point-wise technical and practical details on TRAls proposed KPI, benchmark, methodology and validation mechanism:

B. Mandate for coverage representation using multiple RSRP classifications:

- a) Reference Signal Received Power (RSRP) no longer reflects the true performance capabilities of modern LTE and 5G networks. Today's networks deliver superior service quality even at much lower RSRP levels thanks to smarter radio technologies and advanced signal processing
- b) Dynamic scheduling, adaptive modulation, and advanced error-correction techniques ensure continuity of service even when the signal strength weakens.
- c) Wider 4G/5G carrier bandwidths, up to 100 MHz, enable flexible resource allocation that sustains strong performance even in low-RSRP areas.
- d) Sub-GHz spectrum further boosts reach and indoor reliability, reducing the dependency on high signal levels.
- e) On the other hand, high RSRP but poor SINR leads to very poor voice and data performance.
- f) Evolving UE hardware—from superior RF front ends to highly sensitive receivers supporting higher Tx power, more layers & receive diversity —enhances the ability to decode signals down to much lower thresholds.
- g) Massive MIMO, OFDMA, beamforming, and interference coordination ensure robust performance at the cell edge. VoLTE and 5G voice services also deliver superior audio quality far surpassing legacy voice systems that demanded stronger signals.
- h) Modern 4G & 5G networks have evolved toward interference-aware, SINR-driven optimization with quality of experience (QoE) replacing the legacy signal-strength metrics like RSRP as the true indicators of performance.

Detailed justification on the above points:

- a) **RSRP is a received power metric, not a quality metric and does not determine service performance in LTE or NR:** RSRP measures the average received power of reference signals only. It carries no information about interference, noise, or resource availability, and therefore has no deterministic relationship with the service a subscriber receives. In a real network, quality of experience is governed by SINR and RSRQ, PRB availability and cell loading, MIMO rank and layer count, reported CQI and the resulting MCS, channel bandwidth and numerology, carrier aggregation, beamforming gain, uplink link budget, and transport, core and slice dimensioning.

For an example: A location at -85 dBm sitting in a high-interference overlap zone with SINR weaker than -6 dB will deliver a materially worse experience than a location at -105 dBm in a clean, lightly loaded rural cell with SINR of +6 dB. Under the proposed table the first is published as "Excellent" and the second as "Fair", which inverts the actual consumer experience. Classifying coverage on RSRP alone will therefore mislead consumers in exactly the cases the parameter is intended to address.

- b) **Single threshold table cannot apply across bands, bandwidths and technologies:** The same RSRP value means entirely different things depending on the carrier. RSRP is defined as power per resource element, so a low-band narrow carrier and a mid-band wide carrier

at identical RSRP deliver throughputs that differ by an order of magnitude. -85 dBm on a 5 MHz LTE 850/900 carrier may support only a few Mbps, whereas -100 dBm on a 100 MHz n78 carrier with massive MIMO can comfortably support well above 100 Mbps. Declaring the first "Excellent" and the second "Good" is the opposite of what the subscriber experiences. RSRP Thresholds, are thus recommended not to be retained at all.

- c) **LTE RSRP and NR RSRP are not the same measurement and are not directly comparable:** In LTE, RSRP is measured on CRS, which is distributed across the full channel bandwidth and transmitted on wide sector beams. CRS is used for scheduling as well. In NR two different reference signals are used, SS-RSRP is measured on the SSB, which occupies only 20 resource blocks, is transmitted on a sweeping set of broadcast beams, while CSI-RSRP measured on CSI-RS is used for scheduling. The three quantities differ systematically at the same location. The draft prescribes one common threshold column headed "RSRP for 4G/5G", which is not technically sustainable.
- d) **Massive MIMO beamforming makes SSB-RSRP a systematic understatement of served coverage:** In a 5G massive MIMO cell, broadcast SSB beams are deliberately wider and of lower gain than the narrow, UE-specific traffic beams used for PDSCH. The difference is typically 3 to 6 dB and can be higher on 32T32R and 64T64R configurations. As an example, A UE that reports -102 dBm SS-RSRP may be served on a traffic beam equivalent to -96 dBm. A map classified on SSB-RSRP therefore understates the coverage the subscriber receives, and a validation exercise comparing app-reported SS-RSRP against that map compounds the error. Further, SS-RSRP is beam-index dependent, so two nearby UEs in the same cell can legitimately report values several dB apart depending on which SSB beam they lock to.
- e) **Classifying RSRP <-110 dBm as "No coverage" is factually incorrect:** LTE and NR both operate well below -110 dBm. LTE demodulation performance extends to approximately -124 to -128 dBm RSRP under normal conditions, VoLTE remains usable up to -118 dBm range, and NR with coverage enhancement features, along with NB-IoT and RedCap devices, functions considerably deeper still. Declaring everything below -110 dBm as "Unlikely to be able to use mobile voice, SMS and data services" would incorrectly show the mobile coverage while the subscribers are able to use the network effectively. This thus understates coverage to the consumer, distorts comparison between operators, and conflicts with the stated purpose of the parameter.
- f) **RSRP based classification ignores uplink interference and uplink Tx power, which is the limiting direction for user experience:** All four thresholds are downlink RSRP. In practice coverage is impacted by uplink Tx power and uplink interference which could be caused by tropospheric ducting or external interference which are beyond the control of TSP. With newer devices supporting higher uplink Tx power (Power Class 2 as 26 dBm and Power Class 1.5 as 29 dBm), the coverage gets extended further. A map that shows "Good" downlink coverage in an area where uplink cannot sustain a VoNR call or a video upload due to high uplink interference is not an accurate representation of service, and no amount

of downlink prediction accuracy will fix that. Here again customer usage is the correct metric.

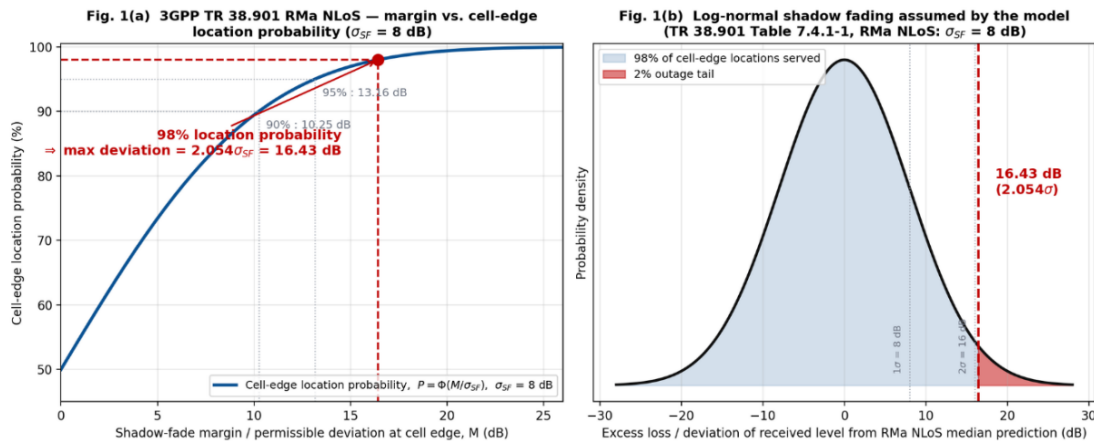
- g) Descriptive text attached to each level may imply service-performance claims that RSRP alone cannot substantiate:** Each level is described in terms of usability of voice, SMS and data, indoors and outdoors. Indoor usability is a function of building penetration loss, which varies from roughly 10 dB for older masonry to over 25 dB for modern glass and metal facades, and is not derivable from an outdoor RSRP prediction. Binding an outdoor signal threshold to an indoor service promise creates an obligation the operator cannot verify and cannot control and exposes it to penalty on the basis of building construction.
- h) Load-Dependency Assumption in RSRP Classification:** CRS in LTE and SSB in NR are transmitted at configured, load-independent power. RSRP therefore does not vary with cell loading in the manner the drafting assumes, whereas the quantities that do vary with loading, namely SINR, PRB availability and throughput, are not part of the proposed classification. The qualifier is neither measurable in the field nor reproducible in prediction and should be deleted or the classification changed to a metric to which it actually applies. The correct metric would be customer usage.

C. Mandate on accuracy of the coverage maps & penalty framework:

- a) 98% accuracy benchmark exceeds the intrinsic accuracy limit of RF propagation prediction:** The prediction accuracy of an RF propagation model cannot be expressed as a single deterministic percentage, as it is inherently statistical and scenario dependent. 3GPP TR 38.901, Clause 7.4.1 explicitly accounts for this uncertainty through the shadow-fading standard deviation (σ_{SF}), which varies by propagation scenario.

For the RMa NLOS scenario, 3GPP TR 38.901 specifies $\sigma_{SF} = 8$ dB, indicating significant spatial variability around the median predicted signal level. Assuming a normal distribution, approximately 68% of locations fall within $\pm 1\sigma$, and 95% within $\pm 2\sigma$. A 98% location confidence level corresponds to approximately $\pm 2.054\sigma$, or ± 16.43 dB for an 8 dB standard deviation.

This magnitude is substantially larger than the proposed 3 dB validation margin and demonstrates that a 98% bin-level prediction accuracy requirement is not consistent with the inherent statistical variability of radio propagation.



This graph illustrates the permissible deviation in received signal level for the RMa NLoS propagation model, as specified in 3GPP TR 38.901, Table 7.4.1-1, with a shadow-fading standard deviation of $\sigma_{SF} = 8$ dB. At a 98% location confidence level, the corresponding statistical margin is approximately $\pm 2.054\sigma_{SF}$, equivalent to ± 16.43 dB.

- b) No major global regulatory framework prescribes a directly comparable accuracy benchmark for public RF coverage maps:** Ofcom publishes coverage on a probability basis and does not impose a bin-exact accuracy percentage. The FCC validates through a defined challenge process rather than a monthly pass mark with automatic penalty. BEREC and ITU-T guidance treat coverage maps as indicative planning outputs. Adopting 98% with a financial disincentive would make India an outlier by a wide margin with no international precedent to reference.
- c) +3 dBm margin is far below the measurement uncertainty of the validation instrument itself:** Samples from TRAI Apps are UE-reported. Under 3GPP TS 36.133 and TS 38.133, permitted absolute RSRP measurement accuracy for a compliant UE is of the order of ± 6 dB, and wider at low SINR or at band edges, before adding chipset and antenna variation across handset models, body loss of 3 to 8 dB, in-vehicle penetration loss of 5 to 15 dB, and building penetration loss of 10 to 35 dB. A +3 dBm allowance does not cover even the 3GPP conformance tolerance in isolation. A map that is entirely correct will therefore be recorded as inaccurate on a significant share of app samples. If crowd-sourced samples are used at all, the margin must be at least 16 dB, or validation must be restricted to calibrated IDT data only.
- d) Sample geolocation uncertainty is comparable to the prescribed grid size itself:** Map is proposed at 50 m x 50 m urban resolution, while smartphone GNSS accuracy is typically 5 to 10 m in open conditions and degrades to 20 to 50 m or worse in dense urban canyons owing to multipath, which is precisely where the 50 m grid applies. Indoor samples fall back to Wi-Fi or cell-ID positioning with errors of tens to hundreds of metres in multipath propagation scenario. A sample can thus be attributed to a hexagon it was never in. There is no proposal to filter samples on reported GNSS accuracy, which is a minimum requirement for any defensible comparison.

- e) **Outdoor predictions cannot be validated against indoor measurements:** Coverage maps are predicted for a defined outdoor reference height, typically 1.5 m above ground. TRAI App samples carry no reliable indication of whether they were taken outdoors, indoors, in a basement, in a lift or in a moving vehicle. Comparing an indoor sample carrying 15 to 25 dB of penetration loss against an outdoor prediction guarantees an inaccurate classification. Validation must be limited to samples that are verifiably outdoor and stationary.
- f) **Accuracy formula has no statistical validity safeguards:** Formula aggregates all samples across all technologies in an LSA with no minimum sample size, no spatial stratification, no confidence interval, and no exclusion of duplicate or clustered samples. Crowd-sourced samples cluster heavily in dense urban areas and, by the drafting itself, are further concentrated at complaint locations, so the denominator is structurally biased towards the worst-performing pockets of the network. A few thousand self-selected samples would then determine a compliance outcome across an LSA containing lakhs of cells. A defensible methodology requires a pre-published minimum sample count per LSA, stratification across urban, suburban and rural clutter, a stated confidence level, and release of the sample set to the operator for verification before any adverse finding.
- g) **The proposed 3D digital-map requirement may not be practically achievable at a national scale:** Ray-trace-grade 3D building models, with accurate heights, footprints and material properties, are not commercially available for the whole of India at the currency required for a monthly compliance cycle. Where such data exists, it covers parts of metro cores, is typically 12 to 36 months old, and does not capture ongoing construction, demolition or facade changes. Mandating an outcome that depends on an unavailable national dataset places the operator in permanent non-compliance for reasons outside its control.
- h) **Computational and data volume at the prescribed resolution and cadence is not sustainable:** 50 m urban and 100 m rural hexagonal grid over the national footprint, replicated per technology and per band, runs into the order of 10^8 to 10^9 grid cells. Regenerating this monthly with ray tracing, and additionally transmitting cell-wise signal strength in dBm for every coverage cell over a REST API for near-real-time ingestion, implies a sustained data exchange of a scale neither party's systems are dimensioned for.
- i) **Cell-wise signal strength disclosure raises security and confidentiality concerns:** Per-cell signal strength combined with grid geometry effectively reconstructs site locations, azimuths, tilts, power settings and capacity distribution. This is competitively sensitive and, in border areas and around strategic installations, a national security consideration. Sharing should be limited to the aggregated published map layer, with granular data provided under a defined confidentiality and access-control framework rather than a continuous open API feed.
- j) **Amber-marking provision introduces a second, conflicting grid and has no exit criteria:** 30 m circumradius hexagon does not tessellate with the 50 m and 100 m grids prescribed

elsewhere, so the operator would maintain two incompatible spatial frameworks for the same map. The trigger includes unverified consumer feedback, and the marking continues "until the actual network performance aligns" with no defined measurement, review period or removal process. This needs an objective trigger threshold, a defined re-validation mechanism and a time-bound closure procedure.

k) 1% false-reporting tolerance is smaller than the uncertainty of the validation method:

Treating a deviation exceeding 1% of the benchmark as false reporting, with escalating financial disincentives, presumes that the Authority's own validation output is accurate to better than 1%. Given the ± 6 dB device tolerance, the geolocation error and the sampling bias set out above, the uncertainty band on the validation result is materially wider than 1%. Penalising a divergence smaller than the error of the measuring instrument is not sustainable in principle.

Point wise inputs on TRAls proposed changes

On proposed QoS parameter and benchmark:

1. **Coverage maps are predictive models, not measured facts:** Published coverage maps are generated from RF propagation prediction tools (e.g., Okumura-Hata, ray-tracing models, UM propagation model), which carry inherent prediction error margins (typically 6–8 dB uncertainty). Even best-in-class propagation models do not guarantee 98% real-world correlation under all terrain, clutter, and weather conditions. Mandating 98% accuracy sets a technically unrealistic benchmark not aligned with any accepted industry or 3GPP/ITU standard.
2. **Coverage is dynamic, not static:** Networks are continuously optimized — new sites added, sectors re-tilted, capacity re-balanced, sites decommissioned. A map is a snapshot; by the time any audit is completed, the underlying network may have already changed. An "accuracy" benchmark measured at a point in time does not reflect this dynamic reality and unfairly penalizes normal network evolution.
3. **Binary classification ignores probabilistic signal behaviour:** At cell edges and in soft-handoff zones, signal presence is probabilistic, not binary. A location may be covered in terms of User experience depending on interference, mobility, and load. Classifying such zones as simply "covered" or "not covered" for service accuracy scoring misrepresents the underlying RF reality.
4. **Misrepresents service quality:** A map showing signal presence does not capture actual user experience — data volume, throughput, latency, call setup success, or drop rates. Focusing regulatory scrutiny on map "accuracy" diverts attention from parameters that actually reflect subscriber experience.
5. **Disproportionate compliance burden:** Validating 98% accuracy across an entire licensed service area (often spanning thousands of sq. km, including remote/rural terrain) would require extensive, continuous drive testing or large-scale crowdsourced data collection — a cost and logistics burden disproportionate to the benefit, especially for maps that are indicative/informational in nature rather than contractual guarantees.

Inputs/Comments on proposed measurement methodology / publishing guidelines:

- 1. RSRP alone undermines the usability of voice/data services:** RSRP measures only the power of the reference signal, not signal quality. A location can show high RSRP (e.g., -80 dBm) but still deliver poor or unusable service if SINR/RSRQ is degraded due to interference, especially in dense urban deployments with tight frequency reuse or overlapping small cells. Classifying such a location as "Excellent" would misrepresent actual user experience. Also lower RSRP but good SINR can deliver good customer experience – thus classifying the location as “poor” would be incorrect as customers are able to use the network fulfilling their requirements.
- 2. RSRP thresholds behave differently across LTE and NR due to architecture differences:**
 - a) In NR, RSRP is typically measured on the SSB (Synchronization Signal Block), which may be a broadcast in a wide beam for cell discovery. Actual data transmission (PDSCH) uses narrow beams, which can have significantly different — often better — effective signal quality than the SSB-RSRP suggests, especially with massive MIMO. A single SSB-RSRP threshold therefore does not represent the throughput a user will experience. Wider 4G/5G carrier bandwidths, up to 100 MHz, enable flexible resource allocation that sustains strong performance even in low-RSRP areas.
 - b) Applying the same dBm threshold uniformly to both LTE and NR ignores this fundamental architectural difference.
- 3. No account for spectrum band variance:** Same RSRP value (e.g., -95 dBm) delivers very different user experience depending on the operating band — sub-1GHz (better penetration, lower bandwidth), mid-band 3.3–3.7GHz, or mmWave (26/28GHz, high capacity but severe blockage / attenuation). A single threshold table applied across bands will overstate coverage quality for high-band deployments and understate it for low-band, since capacity/throughput at a given RSRP varies drastically by bandwidth and numerology. Here again, RSRP is not suggested as useful criteria
- 4. Fixed "50% cell loading" assumption is arbitrary and non-representative:** Cell loading is highly dynamic — varying by time of day, location, and events. A static 50% loading assumption for threshold derivation does not reflect real-world network conditions and cannot be uniformly verified or audited.
- 5. No correlation to actual service KPIs:** 3GPP does not define RSRP thresholds as a proxy for service usability — RSRP is a measurement, not a QoE (Quality of Experience) metric. Actual voice quality (POLQA/MOS scores), data throughput, latency, and jitter depend on a combination of RSRP, RSRQ/SINR, CQI, MIMO rank, and scheduler behaviour — not RSRP alone. Presenting RSRP-only bands as "Excellent/Good/Fair" implies a direct service-quality guarantee that is technically unsubstantiated.
- 6. Uplink interference is not accounted:** RSRP is a downlink-only measurement (from network to device). Uplink interference — critical for voice call setup, VoLTE/VoNR, and upload-heavy

data — is governed by different parameters (UE transmit power limitations, uplink interference) and can be the actual bottleneck in coverage-limited scenarios, particularly at cell edge. A downlink-only metric will systematically misrepresent coverage quality.

7. **Device-dependent variability:** RSRP as measured/reported can vary by device chipset, antenna design, and UE category. The same network condition can show different RSRP readings across device models, making a single universal threshold inconsistent for drive-test/crowdsourced validation across a heterogeneous device base.

Inputs/comments on proposed Validation Mechanism and International references:

1. Flaws in Sample Collection Methodology (TRAI Apps / Crowdsourced Data)

- a) **Uncontrolled device and measurement variability:** TRAI App samples are collected on diverse, uncontrolled consumer devices with varying chipsets, antenna designs, OS versions, and calibration states. RSRP reporting is known to vary by ± 3 –6 dB or more across device models for identical RF conditions (well documented in 3GPP TR 36.805 and GCF/PTCRB device certification variance studies). A single ± 3 dBm margin of error cannot account for this device-level measurement variance, let alone combine it with genuine propagation prediction error.
- b) **No control over indoor/ outdoor/ in-vehicle context:** TRAI App sample does not reliably distinguish whether the measurement was taken indoors, in a vehicle (with body-loss attenuation of 8–10 dB), in a pocket/bag (additional 5–10 dB body loss), or outdoors in the open. Coverage maps typically model specific propagation scenarios (outdoor, indoor-with-penetration-loss). Comparing an unclassified crowdsourced sample against a scenario-specific predicted value is methodologically invalid — it compares two different physical conditions as if they were the same.
- c) **Sample density and selection bias:** Crowdsourced samples cluster heavily in areas of existing smartphone usage (indoors, urban, near-tower locations) and are sparse in exactly the rural/low-coverage areas most likely to be classified "Fair" or "No Coverage." An accuracy percentage computed from a non-uniform, self-selected sample distribution is statistically biased and not representative of "coverage in the LSA" as a whole.
- d) **Consumer-complaint-linked samples introduce circular/negative bias:** Stipulation to prioritize "locations where consumer feedback has been received" deliberately over-samples known problem areas rather than drawing a statistically representative sample of the LSA. This will systematically deflate the calculated accuracy figure — it measures the accuracy of the map in the worst locations, not across the service area, making the resulting percentage non-comparable to any general coverage claim.

2. No International Precedent for 98% Accuracy or Financial Penalty on Coverage Maps: No global regulator other than ARCEP mandates a fixed numerical accuracy benchmark for predicted coverage maps:

- a) **FCC (USA):** Under the Broadband DATA Act and mobile coverage map challenge process, the FCC allows a challenge-and-correction mechanism — carriers correct maps based

on validated challenges — but does not impose a fixed accuracy percentage or automatic financial penalty for map deviation. Correction, not punishment, is the mechanism.

- b) **Ofcom (UK):** Mobile coverage checker data is explicitly published with a disclaimer that it is indicative/modelled, and Ofcom does not penalize operators financially for map/reality mismatches; the focus is on independent drive testing for network performance benchmarking (Connected Nations report), not map accuracy fines.
- c) **BEREC/ EU:** Broadband coverage mapping guidelines rely on modelled data with defined confidence levels, and disputes are handled through correction and republication cycles, not financial disincentives.
- d) **Korean regulatory conditions**
 - o **Grid resolution:** Korea (a global leader in network density and 5G rollout) uses 75m grids, not sub-50m — undercutting the case for a stricter 50m urban requirement.
 - o **Enforcement model:** Korea ties penalties to non-compliance with a corrective order (i.e., failure to fix a flagged issue within a reasonable time), not a direct statistical accuracy score — supporting the "graduated response, not automatic financial disincentive" alternative proposed earlier.
 - o **No centralized real-time API precedent:** Korea's disclosure model is self-hosted and static, reinforcing the objection that a real-time API/GIS ingestion mandate for cell-level dBm data has no established international precedent, including in a comparably advanced Asian telecom market.

Additionally, no major regulatory jurisdiction including ARCEP treats a predictive coverage visualization as a certifiable, penalty-bearing compliance metric at a 98% threshold. Predictive RF models are universally treated as indicative tools, refined iteratively — not warranted, guaranteed outputs.

- 3. **Mixing a predictive/ visualization tool with a service guarantee is inappropriate:** Coverage maps are acknowledged industry-wide (3GPP, ITU-R, GSMA) as modelled estimates, not measured facts. Imposing financial disincentives for prediction deviation effectively regulates a modelling exercise as if it were a contractual SLA — this is inconsistent with the technical nature of the underlying data and would penalize operators for the inherent, unavoidable uncertainty of RF propagation modelling itself, not for any actual network deficiency or service failure.

Inputs/comments on suggestion to use 3D digital maps:

1. 3D Digital Map confinements

- a. **Non availability of standard & approved 3D digital map for India:** High-resolution 3D building/clutter datasets (LiDAR-derived digital surface models, photogrammetric 3D city models) are available only for select metro cores in India, largely through private/commercial survey providers.

There is no source of certified & periodically updated pan-India 3D map dataset covering all urban LSAs uniformly. Mandating "use of 3D digital maps" without specifying an

approved & certified source, standard, or accuracy tier is unimplementable as a uniform obligation across all TSPs and all urban areas.

- b. Prohibitive cost and vendor dependency:** Commissioning or licensing 3D digital surface models (LiDAR flights, drone photogrammetry, satellite stereo-imaging) for every urban service area is capital-intensive and recurring, since urban skylines change continuously (new construction, demolition). This creates dependency on a small set of specialized geospatial vendors, raising cost, data-licensing, and vendor lock-in concerns without any corresponding requirement or funding mechanism defined in the framework.
- c. 3D maps carry accuracy limitations and limited validity period:** 3D digital maps have their own positional and height accuracy tolerances (typically $\pm 0.5\text{--}2\text{m}$ for LiDAR, coarser for satellite-derived models) and require periodic refresh — construction activity in Indian metros is rapid, and a 3D model even 12–18 months old can misrepresent current clutter significantly. Using an inherently time-decaying dataset as the basis for a "prediction accuracy" obligation transfers the very same uncertainty problem one level down, without resolving it.
- d. Security and data-sensitivity concerns:** Detailed 3D building datasets, especially at fine resolution in dense urban cores, may intersect with critical infrastructure, defence-adjacent, or security-sensitive zones. Mandating widespread commercial procurement and use of such data for coverage-map generation raises data-sensitivity and national-security considerations that the framework does not address (survey/mapping activity in India is separately regulated under NMP/DGCA drone rules and geospatial guidelines).

Inputs/comments on Amber Marking of Over-Stated Coverage

- 1. Conflicts with the previously prescribed grid resolution:** Coverage map resolution mandate specifies $50\text{m} \times 50\text{m}$ grids for urban areas, but this clause introduces a 30m circumradius hexagon ($\sim 52\text{m}$ flat-to-flat, roughly similar order but a different geometry/parameterization) specifically for marking. Introducing a second, differently dimensioned grid system solely for flagging creates two overlapping spatial frameworks on the same map, adding rendering complexity and potential visual/data inconsistency for users viewing the map.
- 2. No defined process or timeline to remove the marking:** Clause states marking continues "until actual network performance aligns with published coverage," but does not define: (a) who validates realignment, (b) what re-validation methodology/sample size applies, (c) what turnaround time TRAI commits to for re-verification once the operator claims correction. Without a bounded, reciprocal SLA on the regulator's side, an operator that has already fixed the underlying network issue could remain marked indefinitely, pending administrative re-verification — a punitive outcome disconnected from actual network state.
- 3. Single consumer complaint can trigger a public, persistent penalty marking:** Clause allows marking based on "consumer feedback" without specifying a minimum sample size, statistical threshold, or corroboration requirement. A single unverified complaint (potentially from a device-side issue, indoor location, or handset fault unrelated to actual network coverage) could trigger a visible amber flag on a live public-facing map, causing

reputational and competitive harm disproportionate to the strength of the underlying evidence.

4. **Unreliable validation should not lead to Public Labelling:** Regulatory frameworks in the US (FCC Broadband Data Collection), UK (Ofcom Connected Nations), and EU (BEREC) rely on correction-and-republish cycles — operators are required to fix and update maps within a defined window — not on visibly marking a live public map with a persistent negative indicator.

Introducing a permanent visual stigma on a public consumer-facing tool, based on a still-uncertain validation process (per the earlier rebuttal on margin of error and sampling bias), risks misleading consumers more than it protects them, especially if the underlying "inaccuracy" determination itself is statistically fragile.

5. **Dynamic network changes make static marking obsolete quickly:** Networks are optimized continuously (sector re-tilts, new sites, capacity re-balancing). A grid marked "amber" today based on last month's sample may already reflect a resolved issue by the time it's displayed but will remain marked until the next validation cycle — displaying outdated, potentially incorrect information to consumers, which runs counter to the very transparency objective the provision aims to serve.
6. **No graduated response — jumps directly to public marking:** There is no intermediate step (e.g., private notice to operator, defined cure period, re-test before public flagging) before a public-facing negative marker is applied. This is a disproportionate first response compared to standard regulatory practice of "notify → cure period → re-verify → escalate,"
7. **Compounds the unresolved accuracy/ sampling issues raised earlier:** Since this marking mechanism is triggered by the same validation methodology already flagged as statistically and technically flawed (biased sampling, inadequate margin of error, one-sided accuracy test), any downstream punitive marking inherits and amplifies those upstream defects — a technically weak determination process now results in a persistent, publicly visible penalty.

While TRAI has taken cognisance of the framework adopted by **ARCEP, the French telecom regulator**, in prescribing a **98% reliability threshold for service-wise geospatial coverage maps** published by TSPs, the proposed framework appears to adopt the benchmark without adequately considering the broader regulatory, geographical, economic and operational context in which the benchmark is applied.

Importantly, the **validation mechanism and methodology adopted by ARCEP not considered in its entirety rather than only the 98% benchmark in isolation is considered**. The proposed methodology by TRAI places a significantly greater operational and compliance responsibility on Indian TSPs, including recurring self-validation and regulatory validation requirements. This is materially different from the manner in which ARCEP approaches coverage verification and public reporting.

Further, the proposed framework does not appear to adequately account for the significant differences between India and France in terms of **geographical area, terrain, population, infrastructure availability, fixed broadband penetration, purchasing power, subscriber economics, ARPU, network architecture and consumer usage patterns**. Applying an identical benchmark across materially different regulatory and market environments, without calibrating the implementation mechanism and compliance burden accordingly, may result in disproportionate operational and financial implications for Indian TSPs. A detailed comparison is provided below.

1. Variation in Geography, Population, Terrain and Economics:

Factor	India	France	Regulatory Implication
Total geographical area	Approximately 3.29 million sq. km.	Approximately 0.54 million sq. km. for metropolitan France	India is approximately 6 times larger than metropolitan France. Maintaining and periodically validating coverage-map accuracy across such a substantially larger geographical area entails significantly greater operational effort and cost.
Population	Approximately 150 crores	Approximately 6.9 crores	India has a population approximately 22 times larger , resulting in substantially greater network scale and subscriber management requirements.
Population density	Approximately 497 people/sq. km.	Approximately 128 people/sq. km.	India's higher national average density masks significant variations between dense urban clusters, rural areas and sparsely populated regions, creating very different network deployment and validation challenges.

Terrain and climatic conditions	Diverse terrain comprising mountains, hills, forests, deserts, islands and remote areas, along with monsoons, cyclones, floods, extreme heat and snow in certain regions	While France also has challenging terrain, including the Alps and Pyrenees, a significant proportion of the country is relatively accessible and benefits from well-developed infrastructure	India's geographical and climatic diversity increases both the complexity of network deployment and the cost and feasibility of repeated coverage validation exercises.
Infrastructure and accessibility	Infrastructure and accessibility remain challenging, particularly in rural, remote, hilly and forested areas	Relatively well-developed road, electricity and supporting infrastructure	Limited road access, power availability and supporting infrastructure in India can make both network deployment and repeated physical validation substantially more resource-intensive.
Per-capita purchasing power	2024 GDP per capita approximately US\$2,695	2024 GDP per capita approximately US\$46,103	France has significantly higher economic capacity, which needs to be considered when comparing the affordability and recoverability of network deployment and compliance costs.
TSP ARPU	Approximately ₹175/month	Approximately ₹1,800/month	The significantly lower revenue generated per subscriber in India constrains the ability of TSPs to absorb additional network, spectrum, fibre, tower, energy and compliance costs.
Rural economy	Approximately 850 million rural residents , with a significant proportion dependent on agriculture and relatively lower income and spending power	Smaller rural population approx. 21.9 million , with economic activity across agriculture, tourism, manufacturing and services	Rural connectivity in India can involve lower returns on investment, while power, backhaul, land and forest clearances can create additional deployment constraints. A blanket accuracy mandate could potentially divert resources from network expansion towards measurement and compliance activities.

2. Variation in Regulatory Mandates, Methodology and Validation process:

Factor	TRAI – India	ARCEP – France	Regulatory Implication
Coverage-map accuracy benchmark	Proposed 98% accuracy/reliability for TSP coverage maps	98% reliability benchmark	The benchmark should not be considered independently of the respective regulatory frameworks, implementation methodology and compliance burden.
Map-generation criteria	Coverage classified as Excellent, Good, Fair or No Coverage based on voice, SMS and data usability under specified scenarios, along with prescribed RSRP levels	Coverage classified based on usability of voice, SMS and data under specified scenarios	The regulatory treatment of technical parameters and calculation methodologies needs to be considered alongside the benchmark. Standalone benchmarks with different methodologies should not be adopted.
Validation methodology	TSP self-validation supplemented by TRAI validation through IDT, crowdsourced data and other mechanisms, with recurring validation requirements	ARCEP undertakes regulatory measurements and also uses crowdsourced/third-party data to supplement its assessment	The proposed Indian framework places multiple layers of recurring validation responsibility on TSPs, increasing operational and compliance requirements.
Validation frequency	Monthly/recurring validation	Regulatory assessment based on measurements collected over a period, including annual assessment in relevant contexts	Repeated monthly validation can impose a substantially higher compliance burden and require continuous allocation of manpower and resources.
Financial disincentives	Financial consequences/disincentives may apply for failure to meet prescribed requirements	No general financial disincentive associated with routine coverage-map validation	The consequences of non-compliance should be considered when comparing the two frameworks.

Existing QoS obligations	Extensive QoS framework involving detailed KPIs, prescribed calculation methodologies, periodic reporting, system-based PMR audits, API-based data submission, IDT, OADT, self-drive tests, specific-area audits and other compliance requirements	Comparatively greater emphasis on measurement, transparency, benchmarking and data-driven assessment	The cumulative regulatory burden in India is materially different. Therefore, adopting an individual benchmark from another jurisdiction without considering the overall regulatory architecture may lead to disproportionate compliance requirements.
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3. **Existing Compliance Burden on Indian TSPs:** The proposed coverage-map accuracy requirement needs to be viewed in conjunction with the existing QoS compliance framework, rather than as an independent requirement. Indian TSPs are already subject to multiple layers of monitoring and validation, including:

- System-based QoS/PMR audits;
- Base-data submissions through APIs;
- IDT and OADT;
- Self-drive tests;
- Specific-area audits;
- Coverage-map validation;
- Prescribed KPI calculation methodologies;
- Periodic reporting and data submissions;
- Detailed audit and verification requirements; and
- Financial disincentives associated with specified QoS requirements.

Accordingly, the introduction of an additional stringent coverage-map accuracy requirement, particularly with recurring validation, risks creating multiple overlapping layers of measurement, testing and verification. Such repeated validation activities can divert TSP manpower and resources from more productive activities, including network expansion, capacity augmentation, service improvement and customer experience enhancement. The key issue is therefore **not simply whether a 98% benchmark is technically achievable**, but whether the benchmark, together with its associated methodology, frequency, validation mechanism and financial consequences, is proportionate to the Indian operating environment.

Based on the above it is evident that compared with the relatively data-driven and outcome-oriented approach followed by ARCEP, India's QoS regulatory framework appears significantly more prescriptive and compliance-intensive. Indian TSPs are subject to multiple layers of monitoring and validation, including system-based QoS/PMR audits, periodic base-data submissions through APIs, IDT, OADT, self-drive tests, specific-area audits, coverage-map and prescribed KPI calculation methodologies, in addition to extensive reporting and data-submission

requirements. This results in repeated validation and compliance activities that require substantial TSP manpower and resources.

In contrast, ARCEP places greater emphasis on data-driven monitoring, transparency and comparative assessment, complemented by its own field measurements and crowdsourced/third-party measurements. Its “My mobile network” framework uses operator-declared coverage information, regulatory verification campaigns and crowdsourced data to provide users with comparable information on coverage and QoS.

Accordingly, the key difference is not merely the number of QoS parameters, but the overall compliance architecture. India combines stringent accuracy benchmarks with multiple recurring validation, audit, testing, reporting and data-submission obligations, whereas ARCEP relies comparatively more on regulatory measurement, and data-driven oversight.

It is therefore important for TRAI to take into account the significant differences between the two countries when adopting or mandating any similar compliance benchmarks for specific parameters. A benchmark that may be appropriate in one regulatory and market environment may not necessarily be appropriate in another without considering differences in geography, network deployment, market structure, technology maturity, regulatory objectives and the overall compliance burden on operators.

Further, if the existing QoS framework, together with the proposed amendments, is considered in its entirety, it can be argued that TRAI has incorporated almost all range of KPIs and benchmarks prescribed by various telecom regulatory body around the Globe, often accompanied by more stringent benchmarks and additional or double-factor calculation methodologies, compared with the frameworks adopted by same global regulatory authorities. In many other jurisdictions, regulation tends to be more targeted, focusing on a limited set of critical KPIs and benchmarks as guiding principle only, while allowing competitive market forces to play a greater role in driving overall QoS improvements rather than relying predominantly on extensive regulatory mandates.

It is also important to consider the broader policy implications of this approach. Following the telecom regulatory reforms of 1999, the Indian telecom sector has progressively evolved towards a more market-oriented and competition-driven regulatory framework. An increasingly prescriptive QoS regime, characterized by extensive compliance obligations, repeated audits and validations, multiple testing mechanisms and limited operational flexibility, risks moving the industry back towards a more heavily regulated environment. Such an approach may not only increase the compliance burden and divert TSP resources from network investment and service improvements but could also constrain the operational freedom that has been an important feature of India’s telecom sector’s evolution.

1. PRB Utilization in Massive MIMO 5G

- 1.1. It is respectfully submitted that PRB utilization, taken as a standalone parameter, is not a sufficiently reliable proxy for capacity constraint or for customer-perceived quality of service in contemporary 5G NR networks employing **Massive MIMO and MU-MIMO**.
- 1.2. The PRB Utilization represents occupancy of the available time-frequency resource grid, whereas **Massive MIMO enables multiple spatial layers to be served simultaneously over those same resources**. The capacity delivered at any given level of PRB Utilization is consequently dependent upon radio conditions and the **extent of spatial multiplexing achieved**. Two cells reporting the same figure may therefore be in materially different capacity conditions.
- 1.3. The following evidence is submitted for consideration:
- 1.3.1. Commercial-network measurements demonstrate substantial **capacity gains through MU-MIMO and simultaneous spatial-layer Utilization — Section 2**;
- 1.3.2. The busy period is the condition under which spatial multiplexing is most productive — **Section 3**.
- 1.4. On this basis, it is respectfully submitted that the proposed PRB-Utilization benchmark, together with the associated augmentation and slice-removal consequences, should not be retained as a mandatory quality-of-service compliance parameter. PRB Utilization may appropriately continue to serve as an indicative network-engineering and capacity-planning parameter.

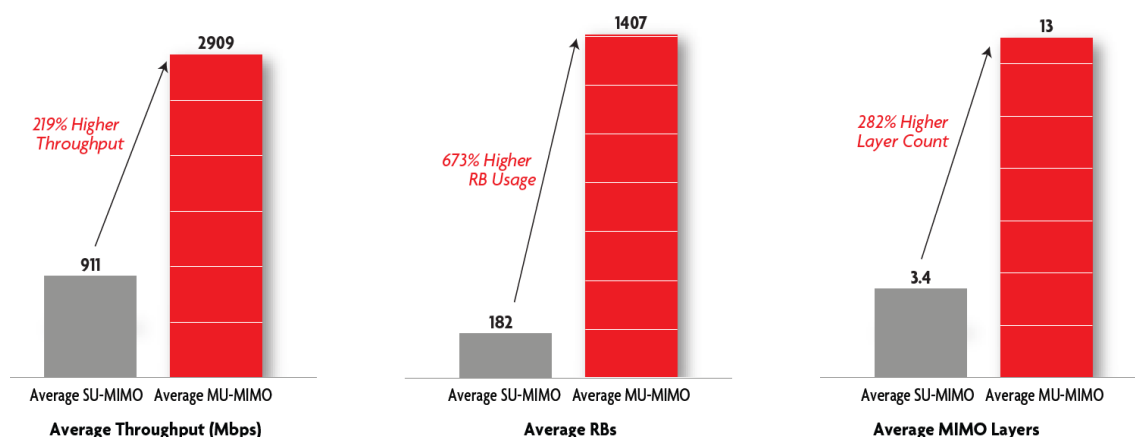
2. Commercial-Network Evidence: Capacity from Spatial Multiplexing

- 2.1. The following measurements were obtained on an operating commercial 5G network, using commercial network equipment and commercially available handsets, rather than through laboratory testing or simulation alone. The commercial nature of the measurements is material.

Study	Configuration	Principal finding
Signals Research Group — Verizon,	Commercial network; band n77; O-RAN 7-2x; virtualised RAN and	Downlink sector capacity up to 3.2× over SU-MIMO across sustained intervals; average sector throughput

Study	Configuration	Principal finding
suburban Dallas, Feb 2024 [Ref. i]	64T64R Massive-MIMO radio; single 100 MHz carrier (~210 RBs); up to 16 downlink MIMO layers; up to eight handsets.	approaching 3 Gbps on a single 100 MHz carrier — a downlink spectral efficiency of 36.4bit/s/Hz against 11.4bit/s/Hz under SU-MIMO. Uplink capacity gain 3.3×.

2.2. In the principal downlink test, the physical resource grid comprised approximately 210 resource blocks. Under SU-MIMO, with each handset served individually, the network allocated an average of 182 resource blocks — approximately 87% of the available grid — delivering over 911Mbps. With MU-MIMO engaged and eight handsets served simultaneously, total resource-block (RB) allocations across the eight handsets reached 1407 over SU-MIMO, i.e. **the total RB allocations for all phones increased by 672%** while the average number of MIMO layers in use rose from 3.4 to 13 (increase of 282%). Average throughput rose to 2,909Mbps (increase of 219%). The study describes the result as "a near-perfect reuse of all available RBs by the eight smartphones used in the test" [Ref. i].



Source: Signals Research Group

2.3. The significance lies in the fact that **the carrier bandwidth, the physical resource grid and the level of grid occupancy were materially the same in both configurations** — occupancy under SU-MIMO already stood at approximately 87%, above the threshold now proposed. The additional capacity was obtained not by occupying more of the time-frequency grid, which was already substantially full, but by **reusing the same resource blocks across multiple spatial layers**. The same cell, at the same occupancy and on the same 100MHz carrier, delivered just over 900Mbps in one configuration and 2,909Mbps in the other [Ref. i].

2.4. Academic work further corroborates the scale of the effect. The University of Bristol and Lund University 128-antenna real-time testbed achieved a measured uncoded sum-rate of 79.4bit/s/Hz serving twelve concurrent users on a 20MHz channel [Ref. ii].

- 2.5. The capacity available from a given level of PRB Utilization is therefore determined by **the extent of spatial reuse achieved**. A cell operating at high Utilization may be delivering several times the capacity of an otherwise identical cell reporting the same figure.

3. Significance of the Cell Busy Day Hour

- 3.1. The proposed parameter is evaluated at the Cell Busy Day Hour. While assessment during the busy period is relevant for capacity planning, selecting the busiest hour does not alter the underlying relationship between PRB occupancy and delivered capacity.
- 3.2. In a Massive-MIMO network the busy period is also the condition under which **a larger population of simultaneously active users is available for MU-MIMO scheduling**, subject to their radio-channel characteristics and spatial separability. This is recognised in vendor engineering literature: a major vendor states that MU-MIMO "improves performance at high traffic loads and in good channel conditions" and is "a **great capacity enhancement tool for highly loaded cells**" [Ref. iii].
- 3.3. Accordingly, high utilization during a busy period should not automatically be interpreted as evidence of inefficient operation or inadequate capacity. It may equally represent effective Utilization of the available resources under high demand.

4. Submission

- 4.1. Based on the foregoing evidence, it is respectfully submitted that:
- 4.1.1. High PRB Utilization is not, in itself, indicative of inadequate capacity in a Massive-MIMO cell. Efficient Utilization of the available time-frequency resources, together with spatial multiplexing, can enable substantially higher aggregate capacity to be delivered from the same radio-resource grid;
- 4.1.2. The busy period is the condition under which **spatial multiplexing is most productive**, so that measurement at Cell Busy Day Hour selects for the circumstance in which high Utilization is least indicative of difficulty; and
- 4.2. In view of the above, it is respectfully submitted that the proposed >80% PRB-Utilization benchmark, together with the associated augmentation and slice-removal consequences, should not be retained as a mandatory quality-of-service compliance parameter.
- 4.3. PRB Utilization may appropriately continue to serve as an indicative network-engineering and capacity-planning parameter, while regulatory assessment of service quality and capacity remains anchored to the customer-facing performance measures established within the applicable QoS framework.

5. References

- i. Signals Research Group / Samsung Networks — "5G Multi-User MIMO: It Isn't Just For Downlink Anymore", February 2024. Commercial 5G network benchmark, Verizon band

n77, suburban Dallas; 100 MHz; 64T64R Massive MIMO; up to 16 downlink layers.
https://images.samsung.com/is/content/samsung/assets/global/business/networks/insights/white-paper/5g-multi-user-mimo-it-isnt-just-for-downlink-anymore/srg_samsung_mu_mimo_study_final.pdf

- ii. P. Harris and others — "An Overview of Massive MIMO Research at the University of Bristol", arXiv:1705.07540. 128-antenna real-time Massive-MIMO testbed with Lund University and National Instruments.

<https://arxiv.org/pdf/1705.07540>

- iii. Ericsson Technology Review — "Meeting 5G network requirements with Massive MIMO", 16 February 2022.

<https://www.ericsson.com/en/reports-and-papers/ericsson-technology-review/articles/using-massive-mimo-to-meet-5g-network-requirements>