Before the
DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Institute for Telecommunication Sciences
Washington, DC 20230

In the Matter of	)	
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An Analysis of Aggregate CBRS SAS Data from April 2021 to January 2023	)	NTIA Report 23-567
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COMMENTS OF ERICSSON

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Ericsson welcomes the opportunity to comment on the National Telecommunications and Information Administration's (NTIA) technical report examining aggregate Citizens Broadband Radio Service (CBRS) Spectrum Access System (SAS) data.[1] Our comments here provide input on improvements that can be made to the CBRS framework, but most importantly urge NTIA to carefully reflect on the challenges of the CBRS framework – for example, unpredictable access to spectrum, transactional costs to operate on CBRS frequencies, lower power levels, spectrum aggregation limits – and the impact those facets of CBRS have on utilization and use cases, especially as it considers spectrum access models in the National Spectrum Strategy. Wide-area, full-power, fully licensed spectrum, or where necessary, pre-defined sharing (e.g., geographic or time-driven protection zones) should remain the goal for commercial spectrum bands.

I. INTRODUCTION

Ericsson is a global provider of Information and Communication Technology (ICT) to communications service providers. We enable the full value of connectivity by creating game-

[1] Douglas Boulwar, et al., *An Analysis of Aggregate CBRS SAS Data from April 2021 to January 2023*, NTIA Report 23-567 (May 2023) ("NTIA CBRS Report" or "Report").

changing technology and services that are easy to use, adopt, and scale, making our customers – and *their* customers – successful in a fully connected world.

Ericsson is a leading provider of CBRS Device (CBSD) radio and Domain Proxy equipment, as part of complete solutions that enable access to CBRS Priority Access License (PAL) and General Authorized Access (GAA) spectrum for wireless broadband. Throughout the development of the CBRS framework, Ericsson has played a key role in WInnForum and OnGo standardization with leadership roles in both organizations. Ericsson's radio equipment is available for indoor and outdoor use and is suitable for a variety of deployment scenarios that include mobile and fixed wireless access. Our products are widely deployed by wireless service providers and private network owners in the CBRS band.

It has been several years since the Federal Communications Commission (FCC) auctioned PALs and since GAA users began utilizing the band. Given the novelty and experimental nature of the CBRS band, it is appropriate for NTIA's Institute for Telecommunication Sciences to evaluate the benefits and drawbacks of the three-tiered dynamic sharing regime and its impact on federal incumbents, PALs, and GAA users.

The CBRS experiment has provided valuable lessons on the technological feasibility and challenges of dynamic spectrum sharing. And while aspects of the experiment show that dynamic sharing can work from a technical perspective, CBRS implementation also demonstrates the pitfalls of a complex dynamic sharing system that, for instance, imposes burdensome transactional costs as participants operate on CBRS frequencies, provides best-effort access to spectrum, and limits the power levels possible in comparison with commercial equipment – all resulting in constrained commercial utility. It is important to consider that the CBRS "experiment" has involved the complex interplay of three different elements; incumbent

sharing, local, preemptible licenses, and "licensed by rule" access. All these layers are managed by a SAS database. We focus our response mostly on the utility of CBRS as a framework for incumbent sharing with commercial services.

Along with offering input on how to improve the CBRS spectrum sharing framework, we address more broadly the impact of the CBRS regulatory environment on U.S. spectrum policy going forward. NTIA is currently in the process of creating a National Spectrum Strategy that may consider whether to recommend that a CBRS-like framework be expanded to other bands in the future. Respectfully, Ericsson observes that the United States will not be a leader in 6G communications and technology relying on experimental spectrum sharing formulas, like CBRS. Spectrum that is constrained in access and coverage limits the platform of innovation that 6G seeks to represent. CBRS, as a spectrum sharing framework, was a worthwhile experiment to explore avenues to balance access and coverage needs. However, Ericsson has spent several years working to develop the utility of the band and supporting customer deployments in the band and, while CBRS offers use cases for localized enterprise networks, it is far from optimal for 5G/6G wide-area networks. Sharing methods based on dynamic sharing, like CBRS, are not preferred for commercial systems because they are not likely to optimize usage of the spectrum, and will result in uncertainty regarding access to band, and limited investment and utility as a result.

U.S. government policy should provide the necessary framework to continue the success of commercial wireless networks and pursue a wide-area, full-power, fully licensed spectrum strategy. As demand for spectrum continues to grow, and where federal-commercial spectrum sharing is necessary, the government should prioritize predefined sharing regimes.

II. THE CBRS MODEL SHORTCOMINGS LIMIT UTILIZATION AND USE CASES AND SHOULD NOT BE VIEWED AS A LEADING OPTION FOR FUTURE SPECTRUM BANDS

As Ericsson recently discussed in its comment to NTIA on the National Spectrum Strategy, dynamic spectrum sharing is not a panacea for spectrum scarcity.[2] While the NTIA CBRS Report focuses on the number of CBSDs and their location, that assessment does not consider the drawbacks of the CBRS framework and its impact on utilization of the band and use cases – especially in comparison to commercial licensing frameworks with assured access and standard power levels. To fully gauge the CBRS framework, NTIA could engage in continued monitoring to understand utilization and use cases and to capture how CBRS dynamic sharing and the limitations therein are impacting utility of this valuable mid-band spectrum.

When compared to other commercial bands, the CBRS dynamic spectrum sharing approach provides for intermittent or preemptible access to spectrum and only allows lower transmit power levels, restricting the band to small cell deployments and limiting use cases to best effort unless paired with licensed spectrum. Standalone CBRS, thus, is not designed to allow dependable and high performance uses at scale that are a prerequisite to support critical services, and CBRS spectrum aggregation restrictions further limit its ability to meet wide-bandwidth customer service demands. Specifically, these kinds of deployments have yet to meet the needs addressed by commercial networks like 5G NR and are not as suited for serving critical use cases. Below we discuss different aspects of the CBRS framework that support this conclusion, we suggest ways that the CBRS framework could be improved for enterprise and

[2] Comments of Ericsson, Development of a National Spectrum Strategy, Docket No. NTIA-2023-0003 (filed Apr. 17, 2023).

commercial use, and address considerations that NTIA and spectrum regulators should consider when looking at allocation frameworks for future bands.

The CBRS framework offers unreliable access to spectrum, limiting utilization and the use cases that can be deployed in the band. A dynamic sharing framework like CBRS poses unique challenges for commercial operations. The fact that access to spectrum is uncertain and can be interrupted limits the dependability of operations in the band, narrowing the use cases operators and enterprises can deploy and effectively relegating shared spectrum users to best-efforts service or use cases. This is contrary to the highly reliable service that users and customers have come to expect from wireless providers.

Standalone operation is suitable for private network owners for enterprise use, for instance, and restrictions imposed by the CBRS framework do not unduly restrict their business model. However, uncertainty of access changes the nature of the band when compared to bands with exclusive, licensed access regimes. Commercial users may see more utility in CBRS to provide supplemental capacity, operating in tandem with other bands that are exclusively licensed and thus enable assured access, to meet Service Level Agreements.

The reality is the CBRS band is currently not able to function as a "primary" band for many commercial use cases, even with the existence of the PAL tier.

The lower power levels necessitated by CBRS further restrict utilization and use cases in the band. Although the CBRS band, 3.55-3.7 GHz, is located in prime spectrum that much of the world has identified for 5G wide-area deployments, the emission limitations imposed on CBSDs have constrained their use in wide-area wireless networks, severely limiting the utility of both PALs and GAA use. Many PAL winners and some GAA users too are in the business of providing high-capacity coverage networks and utilize the lower transmit power CBSDs to boost

capacity in some areas.[3] As CTIA has noted, a wide-area deployment under the lower power CBRS regime "would require five to seven times more base stations than traditional commercial licensed network deployments."[4]

The lower power limits negatively affect other types of users as well. For example, deployments that support mining companies and agriculture typically need to cover large swaths of outdoor land. Although CBRS offers better power levels than unlicensed device operations, the CBRS power levels are significantly lower than optimal deployment for these use cases.

Compared to global spectrum allocations, the CBRS band fragments U.S. 3 GHz spectrum and creates a unique and more costly equipment ecosystem. In the United States, the CBRS band sits squarely in the middle of key mid-band 3 GHz spectrum that nations across the globe are allocating to support full-power, wide-area networks essential to the success of 5G.[5] The fragmentation of 3 GHz mid-band spectrum in the United States has several negative consequences for commercial operators. Fragmentation of future bands should be avoided.

The out-of-band emissions (OOBE) and transmit powers authorized in the CBRS band are out-of-step with globally harmonized standards. This means that equipment for the CBRS band is not aligned with other equipment across 3GPP band class n77 (3.3-4.2 GHz). The need

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[3] The NTIA CBRS Report itself documents that as of January 1, 2023 there were 276,949 outdoor CBSDs (most of which were Cat B) as compared to only 10,084 indoor CBSDs. These numbers demonstrate the appetite for outdoor, wide-area networks. *See* NTIA CBRS Report at 6.

[4] Comments of CTIA, Development of a National Spectrum Strategy, Docket No. NTIA-2023-0003, at 21 (filed Apr. 17, 2023) (citing *CBRS: An Unproven Spectrum Sharing Framework*, Recon Analytics, at 7 (Nov. 14, 2022), https://www.ctia.org/news/cbrs-an-unproven-spectrum-sharing-framework (citing to *5G Mid-Band Spectrum Deployment*, RYSAVY RESEARCH at 3 (Feb. 11, 2021), https://rysavyresearch.files.wordpress.com/2021/02/2021-02-5g-mid-band-spectrum-deployment.pdf)).

[5] *Comparison of total mobile spectrum in different markets*, Analysis Mason, at 10-11 (Sept. 2022), https://api.ctia.org/wp-content/uploads/2022/09/Comparison-of-total-mobile-spectrum-28-09-22.pdf.

for unique, U.S.-specific radios across the 3 GHz bands imposes additional complexity in the product development and production process, including supply chain uncertainties with respect to a U.S.-only filter product. This has already had repercussions for operators and manufacturers in the mid-band market in the United States, such as adding additional hardware on sites, leading to higher tower loading and power requirements. Manufacturers have been forced to create a separate platform for these products to comply with the regulatory requirements, even though a globally harmonized n77 ecosystem existed.

The fragmentation of the 3 GHz band into three segments (3.45-3.55 GHz, 3.55-3.7 GHz, and 3.7-3.98 GHz) with different transmission characteristics has led to a patchwork of regulations. Equipment solutions to cover the 3 GHz band in the U.S. requires multiple radios, complicating and slowing down U.S. wireless providers' deployment efforts and timelines because radios are contained in separate enclosures, or a single enclosure with multiple radios that will be larger and heavier, potentially impacting the placement and siting process. The need for multiple radios also creates environmental consequences, as they will require more power than a single radio. These realities are driving vendors, including Ericsson, to seek waivers from the FCC to enable the deployment of equipment that may span more than one of these segments. Even so, it is impossible to build a cost-effective solution that spans all three bands and is capable of sharing a single antenna. This is primarily a U.S.-only problem.

All this continues to undermine U.S. leadership in innovative technologies. Adding unique restrictions to certain bands smothers technology commodities in the United States even as technologies are evolving globally. The temptation to produce a new improved dynamic sharing regime, building on the experience of CBRS, must account for how any limitations will

affect utilization and use cases, as well as the viability of business models and successful user experiences.

Aspects of the CBRS framework are inefficient and should be revisited. Along with the issues raised above, several other aspects of the CBRS framework can be improved within the 3.55-3.7 GHz band and otherwise underscore the concern that such a dynamic spectrum sharing framework would be used in concert with 5G/6G.

First, the Environmental Sensing Capability (ESC) networks create large areas where networks cannot be deployed, even when no incumbent is present, so-called "whisper zones." This is extremely problematic in a band that is intended to maximize efficient spectrum use. Further the presence of multiple sensing networks is cause for additional inconsistency of operation. Alternate schemes for identifying incumbent presence must be considered.

Second, Dynamic Protection Areas (DPAs) need to be reduced to make the band more successful. The propagation models and need to regularly calculate aggregate interference power have been demonstrated to be overly conservative, limiting network deployment in many important (cluttered) areas. The fact that over 50 percent of CBSDs are in DPA-impacted areas inhibits the roll out of networks that demand availability in those areas.

Additionally, PAL spectrum as a tier that should be accorded priority is not fully reflected in the way the SAS manages interference budgets when coordinating spectrum use. Regulators should consider improving the viability of PAL operations.

Also, as far as Ericsson is aware, most CBRS interference complaints are based on GAA operation. There is still no sufficient standardized and enforceable interference resolution mechanism among GAA users. Clarity and enforcement of regulation here is needed. This

problem will only become more acute as GAA network deployment density grows, or demand will wane if interference issues override the appeal of the band.

In summary, where incumbent sharing is required, regulators should look for simpler and more reliable solutions than adopted in the CBRS framework. Only when these simpler solutions are exhausted should higher complexity sharing be entertained, but only if it can be shown that the introduction of commercial services can be supported. When dynamic sharing is employed new services will likely suffer from lower dependability. Therefore, experimental regulatory proposals should avoid fragmenting global spectrum bands or impeding the introduction of commercial services.

III. WIDE-AREA, FULL-POWER, EXCLUSIVE, LICENSED SPECTRUM SHOULD REMAIN THE GOAL FOR COMMERCIAL SPECTRUM BANDS

Ericsson is engaged in efforts to study and prepare for 6G operations. As part of this work, Ericsson is keen to understand how different spectrum allocation models may play a role in the development of next-generation networks. It recently published a white paper titled "6G Spectrum – Enabling the Future Mobile Life Beyond 2030."[6] The paper focuses on the role of spectrum to unleash the full potential of 6G, the importance of existing spectrum as well as additional spectrum, and the need to consider proper spectrum access regimes. The takeaway is clear: exclusive use, wide-area access regimes remain critical for supporting new innovative services and use cases in the 6G era.

While Wi-Fi and other indoor solutions will continue to play an important role in offering data connectivity in indoor environments, wide-area mobility and fixed wireless networks remain

[6] Ericsson, *6G Spectrum – Enabling the Future Mobile Life Beyond 2030* (Mar. 2023), https://www.ericsson.com/4953b8/assets/local/reports-papers/white-papers/6g-spectrum.pdf ("Ericsson 6G White Paper").

key to enabling dependable and resilient connectivity across all environments. And licensed wireless networks – with assured access, interference protection, and standard power levels – are essential for the certainty necessary to invest in these wide-area networks. This is especially important for use cases like extended reality (XR) that require the seamless mobility that only wide-area wireless networks provide. In contrast, as discussed above, spectrum sharing access models may dictate that only certain use cases can be supported and not necessarily those that the market needs or wants.

Simply put, full-power spectrum licenses with interference protection and flexible rights for wide-area deployments provide a platform that can be shared by many industries and should remain the preferred spectrum access model for wireless services to maintain service quality. Commercial stakeholders' experiences with the CBRS band over the last several years confirm this conclusion.

Ericsson understands that, as demand continues to soar for this finite resource, regulators may need to consider whether to adopt sharing frameworks between federal operators and commercial operators. Having supported users in shared bands like the AWS-3 or 3.45 GHz band and in the CBRS band, Ericsson can say with confidence that not all sharing frameworks are created equal. To support U.S. leadership in next-generation networks, including advancements in 5G and 6G, regulators should seek to accommodate incumbent uses in a band through the least restrictive means on the new services in the band, including relocation or repacking of incumbents.

IV. CONCLUSION

Especially as it considers spectrum access models in the National Spectrum Strategy, Ericsson urges NTIA to carefully reflect on the challenges of the CBRS framework discussed above, for example, unpredictable access to spectrum, transactional costs, lower power levels.

Those challenges have a direct and significant impact on spectrum utilization and use cases. The NTIA CBRS Report contributes some data on CBRS but not the whole story when it comes to evaluating the success of the dynamic spectrum sharing regime in the 3.5 GHz band. Going forward, NTIA should prioritize solutions that enable wide-area, full-power, fully licensed spectrum, or where necessary, pre-defined sharing, should remain the goal for commercial spectrum bands.

Respectfully Submitted,

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