Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230

In the Matter of	)	
Development of a National Spectrum	)	Docket No. 2023-0003
Strategy	)	

COMMENTS OF COMMSCOPE

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COMMENTS OF COMMSCOPE

CommScope, Inc. (CommScope) submits these comments in response to the Request for Comments issued by the Department of Commerce, National Telecommunications and Information Administration (NTIA) in the above-referenced proceeding.[1] CommScope applauds NTIA's commitment to make more efficient use of finite radio frequency spectrum resources and to develop a fulsome National Spectrum Strategy. CommScope enthusiastically supports NTIA's effort to further advance the development and deployment of wireless broadband services while also simultaneously ensuring that important federal incumbents have access to the spectrum resources necessary to support their services.

As discussed in greater detail below, CommScope does not view the needs of non-federal (i.e., commercial) and federal users as mutually exclusive. New strategies, methods and technologies and have facilitated spectrum access by commercial and federal users, and CommScope anticipates that further success can be achieved in the near term.

I. STATEMENT OF INTEREST

CommScope is a global provider of infrastructure solutions for communication and entertainment networks. Our solutions for wireless networks enable service providers including cable, telephone and digital broadcast satellite operators and media programmers to deliver

[1] *Development of a National Spectrum Strategy, Request for Comments*, 88 Fed. Reg. 16,244 (March 16, 2023).

media, voice, Internet Protocol (IP) data services and Wi-Fi to their subscribers and allow enterprises to experience constant wireless connectivity across complex and varied networking environments. Our base station and microwave antennas, RF filters, cell site connectivity solutions are supported by our broad array of services including technical support, systems design and integration.

CommScope has a team of more than 30,000 employees located strategically around the globe to serve our customers in over 150 countries. Our customers include substantially all of the leading global wireless operators as well as thousands of enterprise customers, including many Fortune 500 enterprises, and leading cable television providers or MSOs, which we serve both directly and indirectly.

During each of the last four years, together we invested more than $600 million annually, on average for research and development to build upon our tradition of developing highly-engineered connectivity solutions, while demonstrating superior performance across various generations of networks. Our ongoing focus on engineering innovation has enabled us to create high-quality products that are reliable, have a desirable form factor and enable our customers to optimize the performance, flexibility, installation time, energy consumption and space requirements of their network deployments. With 16,000 patents and patent applications, our significant proprietary IP and deep engineering expertise allow us to create industry defining solutions for customers around the world.

The Comsearch division of CommScope is the pre-eminent global provider of wireless spectrum management and engineering products and services. Comsearch has developed industry-standard interference analysis and mitigation processes and procedures and maintains state-of-the-art software and comprehensive databases used in the design of complex wireless

systems. Our commercial and government customers rely on us for innovative yet cost-effective solutions to the challenges posed by 21st century wireless deployments. Comsearch has been a TV White Space database administrator[2] and a Citizens Broadband Radio Service (CBRS) Spectrum Access System (SAS) administrator and Environmental Sensing Capability (ESC) provider.[3] We have also been conditionally selected as an Automated Frequency Coordination (AFC) system administrator for the 6 GHz bands.[4]

Comsearch interacts regularly with the FCC and NTIA, and actively participates in various industry groups such as the Wireless Innovation Forum (WInnForum), the OnGo Alliance, the National Spectrum Management Association (NSMA), the Telecommunications Industry Association (TIA), and the Institute of Electrical and Electronics Engineers (IEEE) to develop rules, industry recommendations, and standards that promote the efficient use of the radio spectrum

II. COMMENTS

CommScope provides responses to NTIA's specific questions concerning radio frequency spectrum access, sharing and management below.

[2] *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Designated TV Bands Device Database Administrators*; 26 FCC Rcd 554; ET Docket No. 04-186; Jan 26, 2011

[3] *WTB And OET Approve Four Spectrum Access System Administrators For Full Scale Commercial Deployment In The 3.5 GHz Band And Emphasize Licensee Compliance Obligations In The 3650-3700 MHz Band Under Part 96*; 35 FCC Rcd 117; GN Docket No. 15-319; Jan 27, 2020

[4] *OET Announces Conditional Approval for 6 GHz Band Automated Frequency Coordination Systems*; ET Docket No 21-352; Nov 2, 2022

Pillar #1 – A Spectrum Pipeline to Ensure U.S. Leadership in Spectrum-Based Technologies

Question #3: What spectrum bands should be studied for potential repurposing for the services or missions of interest or concern to you over the short, medium, and long term?

Response: Currently, the 3.1 GHz band (3100-3450 MHz) is being studied under the National Spectrum Consortium (NSC) PATHSS effort.[5] We recommend NTIA review the report and continue collaboration with all stakeholders in making that available for shared commercial/federal use.

In addition, we recommend study of the 7/8 GHz bands (7125-8400/8500 MHz) for flexible use.[6] Federal spectrum allocations in these bands accommodate Fixed, Fixed Satellite and other services. We note there is also an international allocation for Mobile.

We suggest that study of this band on how to accommodate shared flexible use would greatly improve the U.S. spectrum pipeline. This study should commence with NTIA releasing the Federal Government Spectrum Use Reports for allocations between 7125 MHz and 15.7 GHz at a minimum. However, we recommend concentrating on the 7125-8500 MHz bands initially.

We also recommend NTIA collaborate with commercial and federal stakeholders to study sharing and coexistence under the same approach established by the NSC to study the 3.1 GHz

[5] Partnering to Advance Trusted and Holistic Spectrum Solutions (PATHSS). "PATHSS is intended to provide a forum for industry, academia, and the DoD to exchange information on current and projected military and commercial requirements in these bands, in order to develop viable sharing use cases. The Task Group will consist of one general group open to all members, and one classified subgroup. In order to maximize the utility of this critical information exchange, a representative subset of the PATHSS group will be selected by lottery and provided with access to classified DoD information. That subset will then, collectively, represent what they have learned back to the broader group in an appropriate manner. Like all of our Working Group Task Groups, PATHSS will meet on a regular (monthly and/or bi-weekly) basis."

[6] For example, see, *Spectrum Allocation in the United States*, at p 4, "The 7 to 8.4 GHz range is a significant block of higher frequency contiguous spectrum. The capacity characteristics of this range make it ideal for serving densely populated areas such as urban centers, where traffic requirements are greater." Sep, 2022 (https://api.ctia.org/wp-content/uploads/2022/09/Spectrum-Allocation-in-the-United-States-2022.09.pdf)
See also, "Petition For Rulemaking of The Fixed Wireless Communications Coalition", March 16, 2010, (https://www.fcc.gov/ecfs/document/6015543417/1)

band. In this case, NSC has been able to establish a framework that allows commercial subject matter experts to collaborate with federal spectrum users, along with the NTIA and FCC, to study coexistence in the 3.1 GHz band while protecting classified security domains.

The upper 4 GHz band (4400-4940 MHz) should also be considered. As noted by CTIA, "The mid 4 GHz band is a wide contiguous block of spectrum that provides high capacity for 5G networks. It has been allocated to wireless carriers in many other nations, meaning a similar allocation in the US would support international harmonization efforts yielding cost benefits."[7]

Question #3: Are there spectrum access models (e.g., low-power unlicensed, dynamic sharing) that would either expedite the timeline or streamline the process for repurposing the band?

Response: We suggest that dynamic sharing models could be considered in situations where other options such as relocation or band segmentation are not feasible or practical. Examples of dynamic sharing methods include for example (but certainly are not limited to) centralized spectrum access manager such as a SAS used in the CBRS band, the Dynamic Frequency Management System (DFMS) suggested for frequency management of control-and-non-payload communications (CNPC) links in the 5030-5091 MHz band to support UAS operations in the United States[8] as well as the AFC mentioned above.

Question #4: What factors should be considered in identifying spectrum for the pipeline?

Response: We recommend that NTIA review the CSMAC final report and recommendations from the Identifying Key Characteristics of Bands for Commercial

[7] *Supra* at 5

[8] *Spectrum Rules and Policies for the Operation of Unmanned Aircraft Systems*, Notice of Proposed Rulemaking, WT Docket No. 22-323, December 23, 2022, ¶26 "We use the term DFMS to describe a frequency coordination system that, in response to requests from UAS operators for frequency assignments in NNA spectrum, would determine and assign to the requesting operator, through an automated (non-manual) process, temporary use of certain frequencies for a particular geographic area and time period tailored to the operator's submitted flight plan."

Deployments and Applications Subcommittee, November 2017.[9] This CSMAC subcommittee identified the following to criteria to help assess federal bands for potential sharing:

- **Propagation and coverage:** lower frequencies provide for greater propagation and coverage, but propagation limitations can be used at higher frequencies for interference mitigation.
- **Capacity:** higher frequencies not only provide for greater capacity but also enough bandwidth to provide for multiple competitors.
- **Contiguity:** adjacency to similar or complementary uses and the ability to provide contiguity will be band specific. Contiguity is much more difficult in the low and medium low bands of spectrum (less available spectrum, more densely used).
- **International harmonization:** will generally be frequency/band specific. Although some spectrum alignment is needed for harmonization, technological advances have provided some flexibility for harmonization. Rather than requiring the exact spectrum band be available for the same service throughout the world, in some cases, operators can benefit from economies of scale when the equipment is designed to operate over a range of frequencies.
- **Incumbency:** will also generally be frequency/band specific but does have some parallels with contiguity. Incumbency issues will be critical to any sharing methodology in order for federal government and commercial uses to coexist.

Although these characteristics refer to shared spectrum, we suggest that they can also be considered for identifying spectrum in the pipeline.

See also, "Feasibility study on existing spectrum sharing frameworks for temporary and flexible spectrum access".[10] This study addresses technical approaches for automated spectrum access to support dynamic, temporary, and flexible spectrum sharing. The report presents the challenges and benefits of sharing in numerous spectrum bands while taking into consideration several factors including types of incumbents in the band, how the bands are used and the nature of usage. The report also discusses some of the business models for existing shared bands and

[9] See *CSMAC Key Characteristic Subcommittee Recommendations*, 07/24/2018 (https://ntia.gov/sites/default/files/publications/csmac_2018_key_characteristics_final_document_july_24_2018_meeting_0.pdf)

[10] Wireless Innovation Forum, *Feasibility study on existing spectrum sharing frameworks for temporary and flexible spectrum access*, WINNF-TR-2011, V1.0.0, January 31, 2023 (https://www.wirelessinnovation.org/assets/work_products/Reports/WINNF-TR-2011-V1.0.0%20Study%20on%20Spectrum%20Sharing%20Frameworks.pdf)

possible ones in the future. Key performance indicators to evaluate the sharing arrangements in a band are also addressed.

Question #4: Should the Strategy prioritize for repurposing spectrum bands that are internationally harmonized and that can lead to economies of scale in network equipment and devices?

Response: Yes, but lack of initial harmonization should not hinder prioritization. International harmonization can occur concurrent with development of a spectrum strategy or be part of it.

Question #4: How should the Strategy balance these goals with factors such as potential transition costs for a given band or the availability of alternative spectrum resources for incumbent users?

Response: The majority of licensed commercial access to federal spectrum has happened through spectrum auctions under the auspices of the Commercial Spectrum Enhancement Act (CSEA).[11] The CSEA ensures through the Spectrum Relocation Fund (SRF) that proceeds from these spectrum auctions sufficiently cover the costs for federal spectrum users to relocate. However, cost recovery under the CSEA only accommodates costs for federal spectrum users that have frequency assignments.

We recommend changes to the CSEA to allow for NTIA to receive funding to study feasibility of making these federal spectrum bands available for commercial use. Funding should be available to NTIA well in advance of any spectrum auction to study how to make spectrum available, but also to prepare and manage transition plans.

[11] Public Law 108–494, Title II - Spectrum Relocation

Question #4: How should the Strategy balance these goals against critical government missions?

Response: In the realm of shared spectrum, it is becoming increasingly difficult to mediate among varying interpretations of critical government missions. We recommend creating a set of standards for what constitutes "mission critical" and empower NTIA to apply across all agencies. This could possibly be studied in the CSMAC.

Question #4: How should the Strategy assess efficient spectrum use and the potential for sharing?

Response: The strategy should address means for requiring and incentivizing efficient spectrum use across all federal spectrum users including spectrally efficient systems and spectrum management practices. Federal agencies should also be incentivized to deploy newer and more efficient technologies. We recommend NTIA review the recent FCC policy statement, Principles for Promoting Efficient Use of Spectrum and Opportunities for New Services".[12]

Question #5: Spectrum access underpins cutting-edge technology that serves important national purposes and government missions. Are there changes the government should make to its current spectrum management processes to better promote important national goals in the short, medium, and long term without jeopardizing current government missions?

Response: We recommend NTIA develop strategies to recruit and hire more staff to be able to perform spectrum availability and sharing analyses more quickly, allow for more 70-90 GHz like interactions with the GMF[13], permit public access the GMF (non-classified portion) to allow for broader review of federal spectrum usage and generally improve the data accuracy and management of the GMF (as noted below).

[12] Policy Statement, *Promoting Efficient Use of Spectrum and Opportunities for New Services*, ET Docket No 23-122, Mar 30, 2023

[13] See FCC description of the Millimeter Wave 70/80/90 GHz Service, https://www.fcc.gov/wireless/bureau-divisions/broadband-division/microwave-services/millimeter-wave-708090-ghz-service-0

Question #6: For purposes of the Strategy, we propose to define "spectrum sharing" as optimized utilization of a band of spectrum by two or more users that includes shared use in frequency, time, and/or location domains, which can be static or dynamic. To implement the most effective sharing arrangement, in some situations incumbent users may need to vacate, compress or repack some portion of their systems or current use to enable optimum utilization while ensuring no harmful interference is caused among the spectrum users.

Is this how spectrum sharing would be defined?

If not, please provide a definition or principles that define spectrum sharing. What technologies, innovations or processes are currently available to facilitate spectrum sharing as it should be defined?

Response: We suggest the spectrum sharing definition above is too broad. Strictly speaking, we do not necessarily consider compressing, repacking or relocating as spectrum sharing.

In its simplest terms, spectrum sharing is a way to optimize the use of the spectrum by enabling multiple categories of users to share the same frequencies without causing harmful interference.[14]

Methods for spectrum sharing include managing operation in the frequency, geographic and time domains. This can be static, as in basic frequency coordination[15], or dynamic as in contention-based protocols[16], sense-and-avoid such as dynamic frequency selection[17], Software Defined Radio[18], or centralized, database enabled Dynamic Spectrum Management Systems[19].

Question #7: Have previous efforts to facilitate sharing, whether statically or dynamically, proven successful in promoting more intensive spectrum use while protecting incumbents?

Response: To determine the extent to which a sharing effort is successful, it is important to agree on success criteria. Using the criteria NTIA suggests (i.e., "promoting more intensive

[14] National Institutes of Standards and Technology, Advanced Communications, *What is Spectrum Sharing?* (https://www.nist.gov/advanced-communications/spectrum-sharing)
[15] For example, see 47 C.F.R. Parts 90 and 101, which define frequency coordination for Land Mobile and Fixed Microwave Services respectively.
[16] For example, see 47 C.F.R. Part 15
[17] *Id*
[18] See FCC Knowledge Database Publication # 442812, *Software Defined Radio Application Guide*, Apr 23, 2012
[19] See 47 C.F.R. Part 96, Subpart F and Part 15, Subparts E and H

spectrum use while protecting incumbents). In this context, we suggest that "more intensive spectrum use" refers to more use of spectrum using a sharing method than not. We would add to that criteria, "…without causing harmful interference to any spectrum users; incumbents and new entrants alike."

Considering the following commercial/federal shared bands, we believe sharing efforts have been successful: AWS-1, AWS-3 and CBRS. For both AWS bands, sharing has been accomplished through data exchange portals developed by the federal spectrum users.[20]

For all of these except for CBRS, sharing has been accomplished through pre-defined sharing methods which include the use of protection/exclusion zones and frequency coordination. However, for CBRS, sharing has been managed through a combination Spectrum Access System (SAS), which manages commercial frequency and power recommendations that will not interference with federal incumbent spectrum use, and Environmental Sensing Capability (ESC) to identify that federal spectrum use.

As of March, 2023, the OnGo Alliance reports over 300,000 CBRS devices (CBSDs) deployed in the over three years since CBRS went commercial. In addition, there are over 40 equipment vendors, over 450 authorized end use client devices, over 900 different operators and about 4000 certified professional CBSD installers.[21] The CBRS auction netted almost $4.6B and saw the highest participation of any previous auction with 271 qualified bidders resulting in 228

[20] See 47 C.F.R. §27.1603 Coordination Procedures. We note this describes coordination procedures for the 3.45 GHz band, but the AWS bands are similar (see also, https://www.disa.mil/~/media/Files/DISA/Services/DSO/StrategicPlanningDivision-AWS-3.pdf)
[21] "CBRS Adoption Continues to Accelerate" (https://ongoalliance.org/wp-content/uploads/2023/03/OnGo_CBRS-Adoption-Continues-to-Accelerate.pdf)

auction winners.[22] However, most importantly, there have been absolutely no reports of interference into federal incumbent users.

Pillar #2 –Long-Term Spectrum Planning

Question #2: How can federal and non-federal stakeholders best work together?

Response: As mentioned previously, we suggest the PATHSS process established under the NSC is a viable means to allow for collaboration among federal and commercial stakeholders. Working with federal stakeholders, NSC has established procedures to share both CUI and classified information with commercial stakeholders. We recommend NTIA review the NSC review the NSC process and consider how to replicate the model for future commercial/federal engagement.

We also recommend NTIA review the recommendations from the CSMAC subcommittee on government and industry collaboration which provided several recommendations on how to improve collaboration among all commercial and federal stakeholders.[23]

Question #6: Which, if any, of these spectrum bands or ranges should be prioritized for study and potential repurposing?

Response: As noted above, we strongly recommend study of the 7/8 GHz bands as soon as possible. This should be a priority for NTIA. We also recommend study of the 4400-4940 MHz band.

[22] "Auction of Priority Access Licenses on the 3550-3650 MHz Band Closes", DA-20-1009, 35 FCC Rcd 9287, Sep 2, 2020.
[23] Government and Industry Collaboration Subcommittee Report, CSMAC, May 2015

Pillar #3 – Unprecedented Spectrum Access and Management through Technology Development

Question #4: What are some recommendations for developing an enduring, scalable mechanism for managing shared spectrum access using the IIC or other similar mechanism, with the goal of increasing the efficiency of spectrum use?

Response: Our experience in the CBRS band has shown that the current method for identifying incumbent operations in the lower 100 MHz (3550-3650 MHz) using the Environmental Sensing Capability (ESC) presents many challenges that, when balanced with any benefits, render the ESC as a sub-optimal method for determining incumbent activity.

Perhaps the greatest drawback to the ESC is the need for ESC sensors to be protected from interference due to the very devices the ESC is supposed to enable. ESC networks have been designed to detect shipborne radar activity over 200 km offshore within a roughly 30,000 – 40,000 km^2 area.[24] Since ESC sensors are extremely sensitive radar detectors, that sensitivity renders them susceptible to interference from CBSDs transmitting up to 80 km away. The resulting protection zones around ESC sensors limit operation of CBSDs within these regions.

ESC sensors are also not immune from adjacent-band interference from 3.45 GHz licensees. The FCC addressed this issue in the 3.45 GHz Order saying that "Harmful interference caused to ESC operations will be considered harmful interference to a primary service under our rules and dealt with accordingly."[25]

Although most ESC operators have gone to great lengths to design their networks to minimize this impact, it cannot be eliminated.

[24] See NTIA, "Dynamic Protection Areas Will Spur Spectrum Sharing" (https://ntia.gov/blog/dynamic-protection-areas-will-spur-spectrum-sharing)
[25] *Facilitating Shared Use in the 3100-3550 MHz Band*, 36 FCC Rcd 5987, WT Docket No. 19-348, Mar 18, 2021 at ¶74.

Therefore, due to the inherent challenges with sensor networks to determine incumbent operations such as the ESC, we strongly favor informing incumbent methods like the IIC. We see several benefits to IIC:

- It eliminates these ESC sensor protection zones.
- It also eliminates the potential impact to deployment in the adjacent 3.45 GHz band.
- IIC does not intrinsically suffer from false detections, which occasionally affect ESC sensors due to radio interference from unintentional radiators and any number of other emissions that can mimic brief bursts of radar activity.
- The incumbent controls the information flow. For example, if the DoD desires to obfuscate their operations, they can enter information for different times, frequencies, etc., than they are actually using. In the case of ESC, SASs know much more about DoD's actual use of spectrum.

However, the IIC as NTIA has currently described unfortunately lacks sufficient clarity for federal agencies to fully accept.[26] Key questions include:

- Where is IIC hosted (i.e., with NTIA, agencies or a third party)?
- What are the roles of federal agency stakeholders when interacting with the IIC?
- What are the roles of commercial stakeholders?
- How does IIC interact with commercial spectrum management systems such as SAS?
- How does IIC protect security domains?
- What are the spectrum and regulatory policy implications (e.g., how would IIC be addressed in the Redbook?)?
- Is the development/availability timeline too late to be effective for the 2-4 year spectrum pipeline?
- What is the role of IIC in interference reporting, identification and mitigation?
- How would IIC interact (if at all) with similar agency-developed capabilities such as DoD's Telecommunications Advanced Research and Dynamic Spectrum Sharing Systems (TARDyS3) Tool Suite?[27]
- What is the cost and associated funding?

To address these questions and others, we recommend that the NTIA conduct a series of listening sessions or workshops specifically on the IIC. The purpose of these would be to present

[26] See https://www.ntia.gov/sites/default/files/publications/iic_for_time-based_spectrum_sharing_0.pdf
[27] See https://sam.gov/opp/2f00353d714a4e63bdf17a2ff799c7dc/view

and explain the concept in detail, collect feedback from stakeholders and collaborate on shared vision and approach.

Question #4: What are the costs and complexities associated with automating information on spectrum use?

Response: We see at least two challenges regarding the availability of data on federal spectrum us:

- The actual availability of spectrum assignment data including operating parameters (i.e., data in the Government Master File and the Equipment Location-Certification Information Database), and
- The quality of this data.

Regarding the quality of the data, we note that in 2011, the GAO found that, "NTIA's data management system is antiquated and lacks internal controls to ensure the accuracy of agency-reported data, making it unclear if decisions about Federal spectrum use are based on reliable data."[28]

We recommend that NTIA perform a system-wide data accuracy and clean-up effort. This effort is needed to establish a data baseline and address existing errors.

Regarding the availability of this data, we recommend that restrictions on public access to the federal databases of spectrum usage be reviewed. We are aware of the need to protect sensitive data on federal spectrum use, but we also suggest that there are portions of this data that can and should be made available. Information on spectrum assignments, locations, configurations, licensees, etc. should be reviewed and considered for public review balancing the need for transparency with the need to protect sensitive operational missions.

[28] United States Government Accountability Office, Report to Congressional Committees, Spectrum Management: NTIA Planning and Processes Need Strengthening to Promote the Efficient Use of Spectrum by Federal Agencies, GAO-11-352 (April 2011), available at http://www.gao.gov/new.items/d11352.pdf.

Lack of complete and accurate data on federal systems leads to assumptions, which tends to lead to inefficient analyses.

Implementation Plan

Question: Which of the spectrum bands or ranges should be prioritized for in-depth study, for example, and under what timetable should we work toward to repurpose any identified bands?

Response: As noted throughout, the first band that should be prioritized is the 7/8 GHz band.

III. CONCLUSION

CommScope appreciates the efforts that NTIA has taken to develop a sustainable spectrum strategy and remains committed to further advance this effort in the future. In addition, we look forward to working with the NTIA and all stakeholders the development of a National Spectrum Strategy document and ensuing implementation plan.

Respectfully submitted,

/s/ Mark Gibson

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