

**BEFORE THE
NATIONAL TELECOMMUNICATIONS AND
INFORMATION ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
WASHINGTON, DC**

In the Matter of)
)
Developing a Sustainable Spectrum Strategy) Docket No. 181130999-8999-01
For America's Future)

**COMMENTS OF ELEFANTE GROUP., INC. ON
THE DEVELOPMENT OF A NATIONAL SPECTRUM STRATEGY**

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Elefante Group, Inc. (“Elefante Group”), by its attorneys, hereby submits its comments on the National Telecommunications and Information Administration’s (“NTIA’s”) Request on the matter of developing a National Spectrum Strategy (“NSS”).¹ Elefante Group, a developer and imminent provider of stratospheric-based communications and other services, appreciates the opportunity to present its views as the NTIA undertakes preparation of the NSS and stands ready to assist the agency in any way it may find helpful.

I. INTRODUCTION

The President’s October 25, 2018, Memorandum calling for the creation of an NSS is timely.² The potential growth of existing applications of wireless technology and the emergence of new technologies that would benefit from access to spectrum has reached unprecedented levels. Yet the spectrum that is available to serve those needs is limited. Consequently, a consistent policy applied across all radio frequency bands as to whether, when, and how

¹ NTIA, Notice and Request for Comments, Developing a Sustainable Spectrum Strategy for America’s Future, Docket No. 181130999-8999-01, 83 Fed. Reg. 65640 (Dec. 21, 2018) (“*Request*”).

² Developing a Sustainable Spectrum Strategy for America’s Future, Memorandum for the Heads of Executive Departments and Agencies, 83 Fed. Reg. 54513 (Oct. 30, 2018) (“*President’s Memorandum*”).

spectrum is made available to new entrants within a band is sorely needed. Whether the prospective new entrants and incumbents are Federal or non-Federal users, or a mix of both, a deliberate and thoughtful approach is needed to maximize the potential for all parties to continue to grow and innovate within their spectrum uses.

Moreover, the *President's Memorandum* recognizes that a sound spectrum policy depends upon a good understanding of the future spectrum needs of all users. Elefante Group believes that a demonstration of need, rather than its presumption, is a key to enabling, as best as possible, regulators to provide for both current and future, perhaps today unforeseen, needs across all industry sectors. To that end, a principal task for the nation's spectrum strategy and the regulatory decisions that follow must be to strike a balance among land-based commercial mobile on the one hand and all other incumbent and future services and applications to ensure all users can be given access to sufficient spectrum. The nation's spectrum regulatory actions over the past several years have focused on making as much spectrum as possible available to the commercial land mobile industry, with the result that, today, *six times or more new spectrum has been designated or made available through auction for commercial mobile use in just the past three years than in the previous thirty*, and another seven times or more additional spectrum is actively under consideration for such designation as previously had been designated. While approximately 700-800 megahertz of commercial mobile spectrum was licensed by late 2017 between 600 and 2500 MHz,³ another 5 gigahertz has been made available in the 3.5 GHz Band

³ See, e.g., Mike Dano, "In 2017, how much low-, mid- and high-band spectrum do Verizon, AT&T, T-Mobile, Sprint and Dish own, and where?" FierceWireless (May 30, 2017), available at <https://www.fiercewireless.com/wireless/2017-how-much-low-mid-and-high-band-spectrum-do-verizon-at-t-t-mobile-sprint-and-dish-own> (indicating that AT&T, Verizon, T-Mobile, Sprint, and DISH hold approximately 700 megahertz of spectrum between 600 MHz and 2.5 GHz) (last visited Jan. 22, 2019).

and *Spectrum Frontiers* proceedings.⁴ And the Federal Communications Commission (“FCC”) is considering making available in the near term at least another 5850 megahertz for commercial mobile use in mid- and high-band spectrum.⁵

At the same time, much of the spectrum previously made available for commercial land mobile is not yet being used.⁶ Just two weeks ago, one of the nation’s two largest wireless carriers reportedly indicated it has enough spectrum to roll out 5G and is currently only using 53% of the spectrum it holds.⁷ Notably, this report comes before the 28 GHz Band auction has ended and while the Federal government is currently examining the potential for repurposing at least another 150 megahertz of low-band spectrum.⁸

Elefante Group appreciates the Administration’s objective to have the United States be the world leader in the deployment of next generation network technologies, given the touted

⁴ Specifically 70 megahertz in the 3.5 GHz Band to be auctioned later this year, up to 835 MHz in certain markets in the 28 GHz Band where the Commission’s auction is ongoing, and a further 4100 megahertz of spectrum in the 24 GHz (700 megahertz), the 37 GHz (1000 megahertz), the 39 GHz (1400 megahertz), and the 47 GHz (1000 megahertz) Bands, for which auctions have not taken place. Where 28 GHz Band spectrum is not available in the current auction, it is already held by others, most of whom presumably plan to use it in support of commercial mobile services, most notably Verizon, as part of the grandfathering of LMDS licensees within the band.

⁵ These consist of the 3.7-4.2 GHz Band (0.5 gigahertz), the 25.25-27.5 GHz Band (2.25 gigahertz), the 31.8-33.4 GHz Band (1.6 gigahertz), the 42.0-42.5 GHz band (0.5 gigahertz), and the 50.4-52.6 GHz Band (2.2 gigahertz). Even without the 25.25-27.5 GHz Band, which is critical for the realization of terabit level stratospheric communications in the United States, as explained in these comments, this is another 4.8 gigahertz of spectrum under consideration for commercial mobile.

⁶ See discussion in Comments of Comcast Corporation and NBCUniversal Media, LLC, GN Docket No. 18-122, *et al.*, 30 (Oct. 29, 2018).

⁷ Matt Kapko, “Verizon Wireless says current spectrum holdings are sufficient for 5G buildout,” *FierceWireless* (Jan. 9, 2019), available at <https://www.fiercewireless.com/wireless/verizon-wireless-says-current-spectrum-holdings-are-sufficient-for-5g-buildout> (last visited Jan. 20, 2019).

⁸ Specifically, the 1300-1350 MHz Band and 3450-3550 MHz Band.

benefits to the efficiency and productivity of the American economy that will come of it. Indeed, Elefante Group itself has developed a business plan that, among other things, it believes will help it to be an accelerator of next generation deployments, as explained in the following section. Nonetheless, Elefante Group is concerned, as explained herein, that the apparent rush to free up and make these large amounts of spectrum available to the land-based commercial mobile industry without due consideration of need or the potential preclusive impacts on other spectrum users, emerging technologies, and innovative applications, both Federal and non-Federal, leaves this country's spectrum policy headed toward a near-sighted future. In particular, Elefante Group is concerned that the trajectory of the current spectrum decisions is providing much more spectrum to commercial mobile than needed for America to become the leader in 5G, while at the same time squandering opportunities for the United States to be in the front of the pack globally in other emerging technologies, such as Stratospheric Based Communications Services ("SBCS"). The United States can be a leader in both ways, and it should.

Consequently, Elefante Group applauds the President's initiative and urges NTIA to take a longer view and develop a balanced, comprehensive, and coherent policy for the nation that will help get spectrum management activities back on track. In addition to ensuring American leadership in 5G, this nation's spectrum policies should ensure regulators also promote flexible and forward-looking emerging technologies and solutions, such as those Elefante Group is developing, which will support broad U.S. technology and service leadership and increase America's global competitiveness.

II. ELEFANTE GROUP

Elefante Group, formed in Delaware and headquartered in Denver, Colorado, supported by its prime contractor on the airship and payload technologies, Lockheed Martin Corporation ("Lockheed Martin"), aspires to disrupt the nation's communications and sensing marketplaces

by deploying persistent near-space lighter-than-air platforms to provide SBCS within the fixed services to urban and rural areas, as well as monitoring, tracking, and sensing solutions tens to a thousand times closer than satellites. By enabling connections between fixed locations on the ground, whether between user terminals (“UTs”) or between UTs and gateways, SBCS qualifies as a fixed service. Elefante Group plans to provide wholesale backhaul, enterprise WAN, and end-user broadband service to consumers and businesses. SBCS, as envisioned by Elefante Group, will help the United States win the race to 5G, 6G, and beyond through the wholesale of low-latency, high-capacity critical stratospheric network services deployed more cheaply and faster than land-based networks, including improved deployments of current wireless technologies such as 4G. As such, Elefante Group’s SBCS will complement the capabilities and strength of ground-based networks and satellite systems with advantages that are wholly its own.

Each Elefante Group baseline stratospheric platform station (“STRAPS”), operating at ~19.8 km altitude, will provide wholesale capacity “on day one” of a total of 1 Tbps capacity both up and down to UTs over a coverage area within a 70 km radius, an area of 15,400 sq. km (6,000 sq. mi.). A STRAPS will inherently cover, in almost all market deployments, both urban and surrounding rural areas. Because this coverage would be independent of intermediate infrastructure requirements and challenges faced by ground-based deployments, this means that an area served by an Elefante Group SBCS deployment would have connectivity in place for end use locations that would accelerate a market’s 5G readiness almost instantaneously, supporting 4G, 5G, and Internet of Things backhaul and cell site densification. Elefante Group also will offer wholesale enterprise WAN service as well as broadband internet to end-user residential and business locations. Significantly, Elefante Group’s lighter-than-air STRAPS will have on-board networking capability that will allow multiple UT locations to be connected without any ground-

based physical network support, reducing the latency of the communications, which will be ~5 ms from coverage edge to coverage edge (and less in between), making them comparable to anticipated ground-based deployments, albeit at a fraction of the cost (~ 20%), thanks to the materially reduced upfront and ongoing infrastructure costs of SBCS links.

As the foregoing shows, SBCS presents clear advantages for the rollout of 5G in urban as well as rural markets. Additionally, SBCS will help meet a number of other Administration and FCC objectives, including major private investment in next generation infrastructure and emerging technologies, helping bridge the Digital Divide in both urban deserts that carriers have frequently tended to bypass and non-urban areas, supporting network/small cell densification, maximizing spectrum utilization and spectral efficiency, creating thousands of American jobs in construction, engineering, and operations, and maintaining and restoring communications in the contexts of hurricanes and other natural disasters.

To provide these services and benefits, SBCS will need access to spectrum on a shared basis. As part of its innovation, Elefante Group has, after an extensive investigation and modeling of numerous spectrum bands, including virtually all between 17 and 43.5 GHz and at 71-76 and 81-86 GHz (the latter two, the “70/80 GHz Bands”), identified bands that offer sufficient spectrum and allow Elefante Group to operate compatibly with both the Federal and non-Federal incumbents found there. Access by SBCS in these already incumbent bands will be true sharing, where both SBCS and incumbents can continue to grow. This can all be accomplished without imposing undue constraints on the incumbents by requiring Elefante Group to implement, where needed, technically feasible and economically practical operational mitigation techniques combined with spectrum resource management tools. Specifically, Elefante Group proposes sharing regulatory frameworks, often times building upon sharing

regimes among existing users that are already in place, in the 21.5-23.60 GHz band for SBCS uplinks from UTs to STRAPS, the 25.25-27.50 GHz band for STRAPS-to-UT downlinks, and the 70/80 GHz Bands for feeder links to and from ground gateways and the STRAPS.⁹

Elefante Group intends to deploy SBCS first in the United States in late 2022, provided the regulatory framework, and most particularly access to spectrum, is in place to facilitate that end. An NSS that adopts a balanced approach to spectrum management and recognizes the need for the spectrum regulators in this country to promote emerging and future technologies that can help accelerate next generation deployment and bridge the Digital Divide, such as those represented by Elefante Group's proposed SBCS, will help ensure these plans become a reality. Adopting an NSS that enables SBCS to gain access to spectrum to deploy the services and deliver the benefits described above will allow the United States to seize this opportunity for leadership. The concept of Elefante Group providing low-latency, high-capacity "network in the sky" solutions has gained attention from global operators within regions focused on deploying 5G in competition with the United States, as well as regions with relatively poor telecom infrastructure that are playing catch-up.¹⁰

⁹ In May 2018, Elefante Group filed a Petition for Rulemaking laying out this proposal. *Petition to Modify Parts 2 and 101 of the Commission's Rules to Enable Timely Deployment of Fixed Stratospheric-Based Communications Services in the 21.5-23.6, 25.25- 27.5, 71-76, and 81-86 GHz Bands*, Petition for Rulemaking, RM-11809 (May 31, 2018) ("Petition"). That Petition, which was promptly put out for public notice, remains pending.

¹⁰ See, e.g., Letter from Koki Koyama, Board Director, Senior Managing Executive Officer, Unit President, Space Business Unit, SKY Perfect JSAT Corporation, to Marlene Dortch, Secretary, FCC, GN Docket No. 14-177, RM-11809, 2 (Oct. 19, 2018), attached hereto. JSAT notes that "such services that the Elefante solution will be able to provide will be important for the achievement of next generation networks in an efficient manner."

III. DISCUSSION

Elefante Group appreciates the chance to offer comment in response to the *Request*. In the remainder of this document, Elefante Group will present observations on six areas raised by the *Request*:¹¹ (1) improving the predictability of spectrum access for all users; (2) the use of automation to facilitate spectrum use and expedite sharing; (3) the practicality of promoting efficient and effective spectrum use through the use of interference protection criteria and standards around which radio communications systems and equipment are designed; (4) how investment in Research, Development, Testing, and Evaluation (“RDT&E”) can improve spectrum utilization and sharing; (5) how spectrum management and policy actions can promote greater U.S. global competitiveness, satisfying both commercial interests and the mission requirements and operations of Federal entities; and, finally, (6) the spectrum needs of stratospheric systems over the next fifteen years.

The *Request* also inquires in its paragraph 6, “[h]ow could a spectrum management paradigm be structured such that it satisfies the needs of commercial interests while preserving the spectrum access necessary to satisfy the mission requirements and operations of Federal entities?”¹² Elefante Group sees this as an overarching requirement for its system architecture that the company, in these comments as a whole, answers. The goal of satisfying the needs of all spectrum users in the many non-Federal sectors¹³ would benefit from a spectrum management paradigm that is based on realistic assessments of different spectrum needs, encourages the

¹¹ See *Request* at 65641, ¶¶ 1-5, 7.

¹² *Id.*, ¶ 6.

¹³ Non-Federal sectors include not just the commercial mobile interests that steal the attention of the public and others, but other parts of the communications ecosystem, this nation’s many varied non-communications industries (*e.g.*, utilities and aerospace & defense), and state and local governmental entities, among others.

deployment of compatible systems designed to facilitate spectrum sharing, promotes automation based on exchanged information between systems, and gives strong consideration to the adoption of interference protection criteria and receiver standards.

A. A High Degree of Spectrum Compatibility among Existing Users Improves Predictability and Increased Access for All Spectrum Users

The *Request* asks how “the predictability of spectrum access for all users [can] be improved.”¹⁴ The question as posed by the *President’s Memorandum* implies a binary analysis to improve spectrum use between Federal and non-Federal stakeholders. Cooperation and collaboration between users should not be limited to a binary exploration between Federal and non-Federal spectrum stakeholders, but should extend, in any band, to and among all users in a given band – both current and proposed – as well as in adjacent bands, as necessary.

Additional spectrum designated and under evaluation for release to commercial mobile users under the FCC’s *Spectrum Frontiers* proceeding,¹⁵ which proposes to add, as detailed above, *more than ten times* the spectrum currently licensed to the top wireless network operators in the country below the millimeter wave (“mmW”) bands combined.¹⁶ A

¹⁴ *Request* at 65641, ¶ 1.

¹⁵ *See, e.g., Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Fourth Report and Order, FCC 18-180 (Dec. 12, 2018); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Fourth Further Notice of Proposed Rulemaking, 33 FCC Rcd 7674 (2018); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, *et al.*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, 33 FCC Rcd 5576 (2018); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, *et al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988 (2017); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, *et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016); *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, *et al.*, Notice of Proposed Rulemaking, 30 FCC Rcd 11878 (2015).

¹⁶ *See supra* note 4.

comprehensive plan for improving predictability of access to sufficient spectrum by all users, including emerging technologies, must take a serious look at how much spectrum is being set aside in various bands under applicable spectrum frameworks. Today’s auction frameworks geared toward existing large spectrum holders will continue to cause a majority of the non-Federal licensed spectrum in the United States to be held by the four primary wireless operators in the country – possibly soon to be only three primary operators.¹⁷ Continuation down a path of exclusive licensing through auctions of ever larger amounts of the nation’s spectrum resources to a concentrated few networks without supported discussion of need – including the extent of use of existing spectrum resources – will tend to undermine predictability of access for all other non-Federal and Federal users as their needs grow. This will stifle new and innovative services and emerging technologies that would be developed by entrepreneurial efforts.

A principal way in which predictability of spectrum access for all users can be improved is what might be called true spectrum sharing. Elefante Group submits that true spectrum sharing between services should become part of the regulatory policies of the United States on both the Federal and non-Federal side. Under true spectrum sharing, current operators should be able to grow their operations subject to reasonable conditions (*i.e.*, no undue constraints) in the sharing regime and new entrants should be expected to build compatibility elements into their designs and deployments.¹⁸ True sharing does not occur when incumbents’ growth and ability to modify operations are effectively frozen, or incumbent primary users are rendered secondary

¹⁷ Serving the needs of the large wireless carriers was explicitly the motivation behind the recent changes to the 3.5 GHz Band licensing framework. *See Promoting Investment in the 3550-3700 MHz Band*, GN Docket No. 17-258, Report and Order, FCC 18-149 (Oct. 24, 2018).

¹⁸ In the case of certain incumbent services, such as those supporting aviation and other safety-of-life or public safety operations, a greater degree of demonstration of compatibility may be necessary before allowing new entrants in the same or adjacent spectrum.

relative to the new entrants.¹⁹ In short, true spectrum sharing allows each of the current services to grow and evolve within guidelines and service rules, including designation of multiple services as co-primary in a band.²⁰ The co-primary status among users is critical to support uninterrupted business operations of newly-introduced services as well as the incumbents. And when those guidelines and service rules are clearly laid out for all users within a band, predictability of access is improved for incumbent and new entrant alike. Consequently, the NSS should promote true spectrum sharing, including by creating incentives for users to develop efficient and compatible technologies capable of sharing. A big carrot for compatible equipment and system design by proponents of entry into an already encumbered band would be positive consideration of its efforts to access new spectrum, with the additional upside for the public interest that incumbents will be able to stay in the band and still grow.

Extension of co-primary status to new entrants when their technologies possess the ability to engage in sharing that protects Federal operations supporting national interests without undue constraints would facilitate collaboration and cooperation between Federal and non-

¹⁹ In some pending high-profile rulemakings at the FCC, some operators seeking access to new bands have requested primary status within desired spectrum bands while pushing existing primary services to a secondary status. For example, this is the position of major commercial proponents in the *Spectrum Frontiers* proceeding for the 26 GHz Band (25.25-27.5 GHz), where they seek primary access and any new deployments by primary Federal services would be relegated to unprotected secondary access. With such an approach, true spectrum sharing has not been achieved, as a primary service provider will continue to assert rights and dominance within the band and stifle growth of other services. Only with co-primary designations will collaboration and cooperation be fostered for spectrum sharing.

²⁰ Elefante Group recognizes that already-deployed incumbent equipment may often not be subject to replacement or major modification (outside of normal cycles) to enhance sharing possibilities, but making sure relevant information (both technical and operational) is exchanged provides a better known RF environment for new entrants to assess compatibility and the potential for sharing frameworks.

Federal users, as well as among non-Federal users.²¹ To support spectrum sharing, transparency of use should be a key aspect of the regulatory and policy environment. An NSS should acknowledge that rules that support cooperation and collaboration must be mandatory for a spectrum sharing environment to be fostered and become successful. The NSS should encourage innovations in the radio technologies that support increased spectrum sharing so as to maximize access while enhancing predictability for all users.²²

B. Automation That Manages Spectrum Resources and Enhances Spectrum Use and Expedites Successful and Efficient Sharing Is Built upon Exchange of System Information by Users

The *Request* inquires to what “extent would the introduction of automation facilitate assessments of spectrum use and expedite the coordination of shared access.”²³ Elefante Group submits that automation will often be the key to the success of a sharing mechanism, especially where users are both using the spectrum actively and dynamically, with requirements that are time dependent, and hope to expand and innovate that use over time. Elefante Group supports

²¹ Once a sharing regime is set up, there must be continued dialog between operators in the shared band to address issues as they arise as the use of the band evolves. While new entrants should be required to demonstrate efforts to ensure compatibility with primary incumbents, ensuring continued compatibility and the success, if not the implementation of, mitigation to enable spectrum sharing are shared responsibilities that require good faith cooperation.

²² Elefante Group’s SBCS architecture and operation is a case of compatibility being designed at the outset. *See* Petition at 43-45. Its system architecture exhibits a high degree of spectrum reuse not only to increase system efficiency and maximize capacity, but also to increase the potential for sharing and the implementation of mitigation methods that make that sharing possible. *Id.* at 59-60. Elefante Group recognizes that some services inherently will be able to implement mitigation techniques better than others, but all spectrum services, even passive services and commercial mobile services, should be actively encouraged to consider whether there are steps to improve their compatibility. *See also supra* note 18. That certain services have not been designed for compatibility to date is more a consequence of not being required to because spectrum seemed plentiful than they have tried and demonstrated it impossible.

²³ *Request* at 65641, ¶ 2.

development of automated capabilities to facilitate assessment of spectrum use and dynamically assign spectrum resources to facilitate coordination of shared spectrum access. This will often, if not typically, require that users exchange relevant and operationally sufficient system information and spectrum use data on a real- or near real-time basis, in an appropriately secure fashion, naturally, to allow the automated functions to work.

However, as noted above, the question posed in the *President's Memorandum* and reflected in the *Request* seems, in binary fashion, to limit its focus on sharing between Federal versus non-Federal uses of spectrum. An NSS that seeks to maximize spectrum use in the United States through spectrum sharing as a national policy must equally include evaluation of spectrum use within the broader non-Federal user base to promote spectrum sharing supported by automation among non-Federal users, including, to the extent feasible, mobile service operators. Such an approach has been envisioned in one form within the Citizens Broadband Radio Service (“CBRS”), which includes sharing between non-Federal and Federal users as well as among non-Federal users, supported by spectrum use sensing and automated spectrum use permissions or assignments.²⁴ One or more elements of the CBRS regulatory approach could possibly be adapted to other bands and sharing scenarios to facilitate true sharing among primary users, both new entrants and incumbents. Having said that, the full solution in any situation will likely require additional elements – or different elements altogether – to be incorporated as well, reflecting the operational characteristics of the particular mix of services that are engaged in the sharing. The NSS should place a premium on the incumbents and any prospective new entrants collaboratively working out a sharing mechanism together.

²⁴ See *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959, ¶¶ 80-86 (2015).

An automated capability to facilitate assessment of spectrum use should include several key aspects:

1. Independent, objective, and standard methodologies to assess spectrum use.

Exchange of information regarding actual spectrum usage should be required to the extent needed and as appropriate of all operators in a true sharing environment. Self-reporting may be necessary to a certain extent, particularly when a sharing regime attempts to factor in near-term future use for planning purposes. However, self-reporting mechanisms about actual real-time usage notoriously vary in accuracy and reliability. Accordingly, as much as possible, consistent with mission-sensitive considerations for users, reporting of spectrum use should be automated so as to allow optimized decisions by other users' systems leading to predictability. Sharing regimes in dynamic scenarios that take practical advantage of automated reporting of the place, frequency, and time spectrum actually is being used will maximize utilization by all.

2. Reasonable criteria for what constitutes operational use of the spectrum.

“Protect builds” or “spectrum use reservations” in advance of deployment or use should be minimized as elements of a sharing policy. Reasonable criteria for when spectrum is being used must be established and incorporated into any automated system. Reasonable criteria of spectrum use should not allow creation of unduly large buffers which only serve to reduce the potential use of spectrum without offering any additional practical protection. At the same time, enforcement mechanisms should be in place to prevent over-reporting of usage despite the existence of such use criteria.

3. Independent and standard methodologies to assess compatibility.

To the extent possible, compatibility models should be independently developed (or developed through sufficiently wide consensus) and standardized. Regulatory authorities should

be given the resources to develop such models, with input from Federal and non-Federal users. Models should be representative of the boundaries of proposed uses within a service, not just the most benign as may be proposed by an industry wishing to gain access in rulemaking proceedings. The models used for compatibility should be reflected in the final rules in terms of how licenses can be deployed, including the development of interference protection criteria as discussed below. Naturally, it is necessary, too, that the methodologies be subject to improvements and future changes as knowledge and experience in any sharing framework is accumulated.²⁵

4. Shared access to sufficient information by both Federal and non-Federal users.

A sufficient exchange of information among systems regarding spectrum usage, on an automated basis where spectrum sharing is to be achieved, should be a focus of a methodology to facilitate assessment of spectrum use. However, this exchange can take (and in many cases already does take) a variety of forms, such as ephemerides information for satellite systems or link deployments by fixed service operators. A system to facilitate sharing should take into consideration whether there is the need for quickly giving operators permission to access spectrum in a given time, at a given place, and on a given set of frequencies. Utilization of such methods, among other factors, will allow prospective new entrants to ascertain whether and the extent to which they will be able to obtain direct access to spectrum, which will help facilitate innovation by new entrants. The continued prospect for new entrants to gain access to sufficient spectrum, which will be enhanced by an NSS that promotes true spectrum sharing, is a surer path

²⁵ See *infra* Section III.C (discussing necessary interference protection criteria).

to innovation and new services than relying on entrenched existing operators to introduce new breakthroughs and disrupt the marketplace.

C. Efficient and Effective Spectrum Sharing Would Benefit Materially from Objective, Well-Founded Interference Protection Criteria and Receiver Standards

In paragraph 3 of the *Request*, NTIA asks “[w]hat is the practical extent of applying standards, incentives, and enforcement mechanisms to promote efficient and effective spectrum use?”²⁶ Elefante Group believes that these all form the foundation of successful true sharing regimes. The best incentive for efficient and effective spectrum use by all users is to require spectrum sharing pursuant to appropriate guidelines that require collaboration and cooperation among users. Sharing, almost by definition, requires efficient and effective spectrum use. Consequently, the NSS should, to the extent practicable, require a commitment for spectrum sharing for access to the spectrum needed by an operator, whether an incumbent expanding existing use or a new entrant.²⁷ It goes without saying that any sharing requirement must be backed by enforcement mechanisms to help ensure reliability of any sharing framework which is necessary for sufficient predictability of access. Any operator that fails to honor the limits placed on shared use must face appropriate enforcement action to discourage such behavior.

Elefante Group wishes to focus the remaining comments in this subsection on standards, specifically interference protection criteria (“IPCs”) receiver standards. IPCs are key to developing sharing framework because they help take away the guessing game of what constitutes harmful interference to other users while increasing certainty for all. An NSS should underscore the importance of every service developing fair and appropriate IPCs to which

²⁶ *Request* at 65641, ¶ 3.

²⁷ *See supra* note 20.

potential sharers can design their architectures, transmitters, receivers and operational policies with the assurance that, if they meet those criteria, they will be able to operate. IPCs should not dictate the deployment of other services. Operators should have the flexibility to deploy their systems within the scope of the applicable technical and operational service rules as they see fit while meeting the applicable IPCs.

The lack of IPCs creates disincentives to maximize the utilization of spectrum. More specifically, the absence of IPCs leads to inefficient spectrum use, debates over potential operational interference, and may cause frequencies to lie fallow. The unavailability of IPCs makes it difficult to conduct compatibility studies and obtain fully meaningful results creating an impediment to spectrum sharing.

In addition to IPCs, consideration wherever appropriate of the adoption of receiver standards for new radios deployed by users would also enhance the ability of systems to share and maximize spectrum usage. Currently, standards on receivers are minimal, tending to contribute to inefficient spectrum use and operational challenges in a spectrum sharing environment that could be enough to deter new entrants to consider entry into an encumbered band. In short, the lack of receiver standards has been and continues as an impediment to spectrum sharing.²⁸

D. Investment in RDT&E Will Improve Spectrum-Utilization Methods, and Spectrum-Sharing Tools and Techniques

There can be little doubt that efficient and effective utilization of spectrum by Federal users could be improved by increased RDT&E investment and that such investment will lead to

²⁸ In a number of services, new fixed service links in heavily-used spectrum bands are coordinated through regional operational coordination groups. The adoption of clear receiver standards would facilitate more objective coordination with less potential for preclusive effect on growth by other users.

greater opportunities for true spectrum sharing.²⁹ Indeed, Elefante Group’s SBCS is the result of years and tens of millions of dollars in private investment leveraging technologies that benefited from significant public investment in research, development, and testing across multiple technology sectors conducted by Lockheed Martin as well as incorporating leading edge technologies developed by other companies. The ability of Elefante Group to share with existing users in encumbered spectrum is in significant part a result of that RDT&E investment as is the ability to provide high-capacity communications services.

Elefante Group has engaged in dialogue with a number of Federal agencies regarding its sharing study analysis and mitigation techniques, and plans to remain in conversation with them. Elefante Group also stands ready to leverage the investment it has made in spectrum sharing to assist the Federal agencies in any way reasonable and practical to analyze how they can utilize spectrum more efficiently and improve the ability to share spectrum in a bi-directional manner.

E. Elefante Group Agrees with the President That U.S. Spectrum Management Policy and Actions Should Promote Greater U.S. Global Competitiveness, Satisfying Both this Country’s Diverse Commercial Interests and the Mission Requirements and Operations of Federal Entities

Elefante Group also wishes to comment on the *Request’s* query whether spectrum management and policy actions could present risks for the global competitiveness of U.S. industries.³⁰ The answer is clearly “yes.” Spectrum management policies and decisions, if they are not to harm greater U.S. global competitiveness, must look to expand the opportunity for new entrants and new technologies to have direct access to spectrum domestically. United States national policies are weighted too heavily on making as much spectrum available as possible

²⁹ See *Request* at 65641, ¶ 4.

³⁰ See *id.*, ¶ 5.

through auction, on the belief that the auctioned spectrum, typically won by large incumbents, is needed to roll out the next generation network (based on global standards) and do not optimize the potential benefits from the spectrum resource.

Elefante Group does not dispute that the next generation rollout per the pending international standards, when it occurs, will give users capabilities resulting in the development of new and innovative services and applications. However, at the same time, the NSS should seek to facilitate new entrants developing emerging technologies by allowing them direct access to spectrum. In terms of global competitiveness, Elefante Group submits that support of these types of innovative systems and services can be more of a game-changer than secondary access to wireless capabilities through services controlled by a limited number of large service providers. U.S. leadership in wireless communications, in short, depends not only on keeping up with or outpacing a small set of other more-advanced countries in terms of networks reflecting new international standards, but also in creating meaningful opportunities for new, disruptive entrants,³¹ and in the case of Elefante Group, an innovative techno-solution that supports faster and more widespread deployment of wireless technologies.

To facilitate this, progress has been made in the United States by the FCC and Congress seeking to make unlicensed spectrum available in low-, medium-, and high-band spectrum paired with exclusive licensing in similar frequency ranges through auctions. However, the NSS should embrace a major new dimension to such efforts by promoting true spectrum sharing and enabling non-exclusive, but licensed, operation in a variety of frequency bands, including bands with

³¹ Stratospheric platforms can readily integrate other capabilities that will, in combination with communications capacity, perform in ways that other platforms cannot accommodate, *i.e.*, sensors and trackers with a resolution satellites cannot match and a field of view ground-based systems do not have. Advantages such as these can benefit both commercial interests and Federal Government users – Elefante Group has received interest from both.

current operators. Spectrum sharing where compatibility with incumbents can be supported will create a launch pad for innovation protected from expulsion by operators that demand exclusive access.

Elefante Group's SBCS service is paradigmatic of the types of benefits that access to shared spectrum can create. Stratospheric-based solutions should be promoted by U.S. spectrum policy and strategy because of the reach to cover "instantly" entire markets and surrounding rural areas – or many rural communities in the case of a non-urban deployment – from first day of deployment, and therefore the potential for stimulating new services which, in turn, could stimulate U.S. global competitiveness in a variety of markets in a way that ground-based rollouts alone cannot.³² Not only would SBCS provide rapid access to user locations throughout a large coverage area, as well as subsequent network upgrades and adjustments to service offerings,³³ but could do so at a fraction of the cost.³⁴

Spectrum strategies and policies that promote spectrum access for stratospheric solutions as Elefante Group's in a timely fashion are needed to advance U.S. leadership and bolster the

³² As described earlier, Elefante Group's SBCS solution will instantly provide market wide (6000 sq miles) service, either as a supplement to current network solutions or as the first deployment of current and next generation services where they are not currently provided. With a high-capacity, low-latency SBCS solution, providers can immediately start to focus on deployments of UT equipment at or closer to end user locations and be less dependent on the compilation of market-wide network infrastructure deployments that require multiple elements. This capability offered on a wholesale basis could also serve to stimulate the emergence of new providers.

³³ This would occur when SBCS platforms are changed out on a periodic basis as needed by the operation of the aircraft dependent on the mission duration. In the case of Elefante Group, it expects that platforms would hand over to a replacement once every six or nine months on average, although this could be accelerated to meet wholesale customer needs in specific instances. *See* Petition at 10.

³⁴ *See* Reply Comments of Elefante Group, Inc., GN Docket No. 14-177, 25-27 (Aug. 15, 2018 (demonstrating that Elefante Group's services will have cost advantages over other deployments) ("Petition Reply Comments").

competitiveness of its economy. Elefante Group has received both domestic and international interest in its competitive “Network in the Sky” SBCS, and where spectrum regulatory actions offer the smoothest path to move forward may well play a large role in where Elefante Group will deploy first. Elefante Group’s business case is modeled on a sincere hope that deployment occurs first in the United States.

F. SBCS Current Spectrum Requirements Now and in the Future

Finally, the *Request* seeks information regarding current and future spectrum needs.³⁵ Specifically, in relevant part, NTIA seeks information on “the likely future needs of spectrum users, both terrestrially and for space-based applications, within the next 15 years.”³⁶ NTIA also wants input on whether “present allocations of spectrum [are] sufficient to provide next generation services like Fifth Generation (5G) cellular services and emerging space-based applications.”³⁷ More generally, without limiting itself to satellite and commercial mobile services, NTIA indicates that it intends to “understand[] better the amount of spectrum presently available to provide particular services (or similar services) and estimates of the amount of additional spectrum in each frequency band that the commenter believes is needed.”³⁸

For its initial U.S. deployment, beginning commercially in late 2022, SBCS requires access to at least 4.35 gigahertz of mmW spectrum, including guard band spectrum. As noted above, Elefante Group arrived at this amount after examining numerous candidate bands between 17 and 43.5 GHz, and a few others above and below this range, and taking into account the realities of operating in encumbered spectrum to deliver 1 Tbps communications service to

³⁵ *Request* at 65641, ¶ 7.

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

and from end users from a single platform. A not insignificant portion of the 4.35 gigahertz of spectrum – approximately 25% – is needed to support spectrum sharing, as incumbent operations vary from region to region across the United States, requiring Elefante Group to have a certain amount of channel flexibility for interference mitigation. Elefante Group identified the best spectrum to serve this purpose in its Petition for Rulemaking filed at the FCC as 21.5-23.6 and 25.25-27.5 GHz, supported by almost three dozen spectrum compatibility studies.³⁹ Elefante Group submits that, if the United States is to enjoy a persistent high-capacity, low-latency stratospheric infrastructure solution, access to these frequencies is a must.⁴⁰

In addition, SBCS, as envisioned by Elefante Group, requires access to 10 gigahertz of E-Band spectrum, specifically 71-76 and 81-86 GHz, in a shared spectrum environment for gateway feeder links.⁴¹ Elefante Group feeder links, which will operate at very high elevation angles, will be very compatible with Federal and non-Federal fixed, point-to-point links which operate at those frequencies.

When discussing what future spectrum needs could be, it is necessary to understand to what degree the need for additional capacity density (bits per Hertz per unit area) can be met by other means, such as improvements in technological or system efficiency, or through network densification. By 2034, fifteen years from now, Elefante Group expects to develop and apply modulation techniques and other new technologies that will increase the spectral efficiency of its

³⁹ See, e.g., Petition at 55-66, Appendices; Petition Reply Comments at Exhibits (providing another eight studies).

⁴⁰ As noted in Elefante Group's Petition, competitive non-exclusive SBCS-operator entry into the proposed Ka and E-Band spectrum is possible, increasing spectrum utilization in a given area with overlapping coverage by reusing the same SBCS spectrum. See Petition at 85-101.

⁴¹ See *id.* at 81-85.

SBCS⁴² to derive material increases in capacity from the original spectrum; however, it is difficult to say how much additional capacity density could be generated through such improvements. As a result, to be frank, it is difficult to say how much additional spectrum will be required to satisfy increasing demand for Elefante Group's service in specific markets. In general, because its service (at least as initially envisioned) will principally be supporting carrier backhaul and densification as well as end user broadband connections, it is safe to say that the increase in overall capacity density will be substantial and that at least another few gigahertz of mmW spectrum may be required to meet the needs (again on an encumbered basis) by the early 2030s. New services and applications not contemplated at the outset that may be added may also factor into future spectrum needs.

Elefante Group also wishes to point out that ground-based commercial mobile systems' spectrum needs for mmW spectrum have not been well-defined, as discussed in the Introduction. The alleged need for significant amounts of spectrum, in addition to the more than five gigahertz that has already been designated for flexible mobile use in the mmW bands and 3.5 GHz Band which the FCC is auctioning or will soon schedule for auction, is questionable. More should be done by the commercial mobile industry to demonstrate need and to explain other methods by which additional capacity density is being achieved – such as new modulation schemes, densification, and other methods – before additional spectrum is repurposed for their needs, especially to the exclusion of other innovative spectrum users and the detriment of incumbents. This is particularly the case when a major player like Verizon states that it already has sufficient

⁴² Perhaps Elefante Group will be able to reuse spectrum even more than planned today. The initial configurations will reuse spectrum under an N=4 scheme with 541 beams, meaning spectrum will be used approximately 135 times by each platform. Moreover, each channel will use dual polarization to increase capacity by 100%.

spectrum for a 5G rollout.⁴³ In many markets, both urban and rural, it is not the lack of spectrum that has led to either poor or nonexistent mobile services but the inability for the operators to have access to cost effective network services to support cell site deployments. The ability of ground-based systems to deploy outdoor small cells (for example, femto, pico, and nano cells) in a wide range of spectrum bands to meet a great variety of service applications allows ground-based providers to increase spectrum reuse and be more effective and efficient providing mobile voice and data capacity in a given area, reducing the need for more spectrum.⁴⁴

In light of the foregoing, a “policy” of making more spectrum available for commercial mobile operators *wherever possible without delay and without limit* is not a sound spectrum management strategy for the nation. It is contrary to the public interest of fostering investment in innovation and hurts the overall U.S. global competitive position, as explained in the previous subsection. Claims for large amounts of additional spectrum above and beyond that which has already been made available to commercial mobile users for flexible mobile use should be met with appropriate skepticism by government spectrum managers.

Rather, a forward-looking spectrum strategy should focus on creating incentives for ground-based commercial providers to explore the potential for true spectrum sharing with other types of users, powered by automation, frequency selection, and other mitigation techniques,

⁴³ See *supra* note 7 and accompanying text.

⁴⁴ With up to 80% of mobile calls originating indoors, access to higher spectrum bands being requested by mobile carriers, and improved environmental standards for commercial buildings, the ability of mobile signals to penetrate from outside to inside buildings is decreasing every day. Except for key enterprise customers, wireless carriers tend not to fund in-building systems, either for capital or backhaul operational expenses. WiFi calling fills some of this gap in coverage, as well as enterprise customers funding in-building systems that remain dependent upon spectrum licensed exclusively to carriers, and using carrier-controlled devices and allowing access. More innovative solutions could be possible, such as that originally envisioned with the CBRS before the recent rule changes, with more entities having direct access to spectrum.

something which commercial mobile users have not yet been compelled to do. Adoption of an NSS creates the opportunity to make this a reality. Elefante Group stands ready to work with commercial mobile interests, as well as other users, both commercial and Federal government, to develop frameworks suited to particular bands and mixes of users that maximize the potential for shared access and the benefits that will flow for American government, consumers, and businesses from the resulting increased spectrum utilization.

IV. CONCLUSION

NTIA should develop an NSS consistent with the foregoing to ensure that this country's precious and ultimately limited spectrum resources are managed to promote efficiency, innovation, maximum usage, and a diversity of services to the nation's citizens, businesses, and governmental institutions.

Respectfully submitted,

ELEFANTE GROUP, INC.

/s/

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Its Counsel

January 22, 2019

ATTACHMENT

Letter from Koki Koyama, Board Director, Senior Managing Executive Officer, Unit President, Space Business Unit, SKY Perfect JSAT Corporation, to Marlene Dortch, Secretary, FCC, GN Docket No. 14-177, RM-11809 (Oct. 19, 2018)

October 19, 2018

BY ECFS

Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: **SKY Perfect JSAT Corporation Written *Ex Parte* Presentation; GN
Docket No. 14-177 and RM 11809**

Dear Ms. Dortch:

SKY Perfect JSAT Corporation (JSAT) is pleased to provide its views to the Federal Communications Commission regarding the above-referenced proceedings in which the Commission is examining the potential introduction of Stratospheric-Based Communications Services (SBCS) into the United States that would operate in the 21.5-23.6 GHz, 25.25-27.5 GHz, 71-76 GHz, and 81-86 GHz radiofrequency bands. JSAT applauds the Commission for making the forward-looking decision to consider giving SBCS access to spectrum and appreciates the challenging spectrum management decisions that will be required to enable SBCS to become reality in the United States. JSAT believes that SBCS can bring many benefits to mobile service and other providers and, ultimately, consumers.

JSAT has been a leader in the converging fields of broadcasting and communications. It is Asia's largest satellite operator with a fleet of 17 satellites, and Japan's only provider of both multi-channel pay TV broadcasting and satellite communications services. JSAT delivers a broad range of entertainment through the SKY PerfecTV! platform, the most extensive in Japan with 3.5 million subscribers. In addition, JSAT's satellite communications services cover Japan and the rest of Asia, as well as Hawaii, parts of the United States, and other points in North America, Oceania, Russia, and the Middle East. These communications services play a vital role in supporting safety, security and convenience for society as a whole.

JSAT has a firm interest in SBCS solutions to complement its already growing communications services in Japan and other regions in which it operates and may expand. SBCS would be an ideal solution for 5G back haul in Japan and elsewhere. The principal advantages that JSAT sees in SBCS solutions are the ability to reach a large coverage area of over 15,000 square kilometres with high-capacity, low-latency communications and networking capabilities with the deployment of a single stratospheric platform. JSAT has studied various methods by which small cell densification in urban areas can be achieved, and firmly believes that SBCS has a key role to play in achieving this important objective. Further, the ability to upgrade an entire large metro area with the switch-over from one or a small number of platforms to their substitutes will enable stratospheric-based solutions to remain state of the art more readily than terrestrial backbone networks.

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As the FCC knows, a number of leading aerospace companies in North America, Europe, and Asia are working on stratospheric platforms and related communications payloads. Interest in making such solutions a reality is greater than ever before, and the technologies to enable such solutions have matured in a way that was not true in the past. For the past 3 years, JSAT has analyzed the planned stratospheric platform, payload, and system designs of a number of enterprises in Europe and the United States that intend to provide stratospheric based solutions. JSAT has spent substantial resources in this preliminary effort, including meetings with a number of the leading companies on several continents. JSAT has analyzed their aircraft and payload designs. JSAT has met with the leadership of Elefante Group, Inc. (Elefante) on a number of occasions, both in Japan and in the United States. JSAT has also met with key personnel and management of Lockheed Martin Corporation (Lockheed Martin) – which is providing Elefante with airship and communications technology solutions as its prime contractor – both at JSAT headquarters in Tokyo and at several of Lockheed Martin’s North American facilities, which included the conduct of technical due diligence.

From among the planned systems it has reviewed, JSAT believes that the Elefante/Lockheed Martin approach clearly holds the most feasible and capable promise for realizing a viable platform fleet equipped with advanced communications payloads, including networking capabilities, in the next few years to realize high-capacity, low-latency SBCS services. JSAT is of the view that such services that the Elefante solution will be able to provide will be important for the achievement of next generation networks in an efficient manner. Indeed, the FCC may be interested to know that JSAT is currently in the process of giving serious consideration after own local investigation of the feasibility and market research in Japan to requesting that Japan’s Ministry of Internal Affairs and Communications, Telecommunications Bureau, study the process of identifying and designating sufficient spectrum in the millimetre range of frequencies to ensure that Japan, too, can stimulate a timely set of high-capacity, low-latency SBCS solutions like those that the Elefante system would support.

JSAT encourages the FCC to move swiftly and grant the Elefante petition for rulemaking filed in RM 11809 as a stepping stone to adopting rules enabling operation of SBCS. While promptly taking these steps would allow the United States to assume a leadership role in introducing SBCS to the marketplace, such decisions will help further stimulate the timely design, development, and deployment of stratospheric solutions abroad.

As required by Section 1.1206(b) of the Commission’s regulations, this letter is being filed with the Secretary’s office. It is being filed electronically.

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Respectfully submitted,



Koki Koyama
Board Director
Senior Managing Executive Officer
Unit President, Space Business Unit
SKY Perfect JSAT Corporation

cc: Chairman Ajit Pai
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Commissioner Brendan Carr
Commissioner Jessica Rosenworcel
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