

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC**

In the Matter of

Use of Spectrum Bands above 24 GHz for Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5- 28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95
	)	

**COMMENTS OF ELEFANTE GROUP, INC.  
ON THE SECOND FURTHER NOTICE OF PROPOSED RULEMAKING**

Elefante Group, Inc. (“Elefante Group”), by its attorneys, hereby responds to the Commission’s Second Further Notice of Proposed Rulemaking in the above-referenced proceeding.<sup>1</sup> Elefante Group urges the Commission to proceed to take steps to implement a

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<sup>1</sup> *Use of Spectrum Bands above 24 GHz for Mobile Radio Services et al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, FCC 17-152, GN Docket No. 14-177 et al., ¶¶ 90-109 (rel. Nov. 22, 2017) (“Second Report and Order” and “Second FNPRM”).

regulatory framework to enable persistent stratospheric-based communications and infrastructure in those bands where they can operate compatibly with other permitted uses. More specifically, in response to the *Second FNPRM*, Elefante Group supports initiation of a proceeding to make a Fixed Service allocation, as well as to adopt technical, operational, and licensing rules, in the 25.25-27.5 GHz band to enable persistent stratospheric communications systems as an important piece of this framework.

## I. BACKGROUND

Previously, in this *Spectrum Frontiers* proceeding, Elefante Group described the opportunities presented by stratospheric platform communications systems and incorporates those discussions by reference.<sup>2</sup> To briefly recap, Elefante Group, a United States corporation founded in 2015, aspires to be the world leader in persistent stratospheric-based communications, sensing, and infrastructure. In collaboration with Lockheed Martin Corporation (“Lockheed Martin”), which has several decades’ expertise with lighter-than-air platforms, sensing and communications systems, Elefante Group is designing and developing commercial stratospheric radio communications solutions. Elefante Group is looking to deploy its advanced systems within the next four years.

Elefante Group airships, operating at approximately 65,000 feet altitude (less than 20 km) will have a substantial payload-carrying capacity (approximately 1000 kg) to support high-density, high-frequency re-use terrestrial broadband communications and Internet of Things (“IoT”) -enabling solutions for the communications, government, institutional, and enterprise

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<sup>2</sup> See Letter from Edward A. Yorkgitis, Jr., Kelley Drye & Warren LLP, counsel for Elefante Group, Inc., to Marlene Dortch, Secretary, FCC, Notice of *Ex Parte* Presentation, GN Docket Nos. 17-183.14-177, IB Docket Nos. 17-95, 15-256, 97-95, and 16-408, RM-11664, and WT Docket No. 10-112, at 3-7 (filed Sep. 8, 2017). See also Comments of Elefante Group in Response to the Notice of Inquiry in *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183, (filed Oct. 2, 2017) at 4-9 (“Elefante Group Mid-Band Spectrum Comments”).

sectors. Elefante Group firmly believes that stratospheric solutions will be a key element in the timely deployment of 5G, in rural as well as urban areas, and that stratospheric platform communications systems will advance many Commission and Administration objectives.<sup>3</sup>

The Elefante Group airships will be capable of adjusting altitude and station keeping to accommodate stratospheric winds (and turbulence) and maintain stability for its payloads. An Elefante Group airship's service footprint at 65,000 feet will be up to a 70 km radius for high-capacity communications.<sup>4</sup>

The Elefante Group and Lockheed Martin (collectively, the "Companies") are refining an innovative communications design that possesses exceptional flexibility and yields superior capacity while maximizing spectrum efficiency and the capability to operate compatibly in frequency bands with a variety of other users. To meet expected market demand, the companies are designing for a total communications throughput of one terabit per second (1 Tbps) per airship in each direction (on a non-oversubscribed basis) for communications between each airship and user terminals at the time of launch of commercial operations, with plans for future growth.<sup>5</sup> The Companies' airship design offers persistent, spectrally efficient payloads with

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<sup>3</sup> Elefante Group plans to operate in the Fixed Service on a private carrier wholesale basis and will make possible high-speed broadband connectivity to residences and businesses with cost and performance advantages over other solutions; ultra-high capacity broadband connectivity to establish secure private lines and networks for enterprises; wireless carrier direct access or backhaul for connecting small cells to network infrastructure to meet network densification needs of 5G; and IoT-enabling applications combining sensing and communications capabilities for control, location, aggregation, processing and packaging of data across large and/or remote geographic areas to meet the projected growth in IoT devices and increased data usage.

<sup>4</sup> Elefante Group's solar and fuel-cell powered unmanned stratospheric airship is being designed to operate for a minimum of six months and maintain a fixed position (within 10 km or less) or, alternatively, roam at 35-75 knots true airspeed ("KTAS"), as required by mission type.

<sup>5</sup> The customer communications provided through the Elefante Group airships will principally be either between user terminals or between user terminals and gateways. Elefante Group envisions the gateways operating in separate and suitable spectrum for the high capacities required for such links, specifically as Fixed Services in the 71-76 and 81-86 GHz bands, which the *Second Report and Order* preserved for Part 101 Fixed Services. *Second Report and Order* at §§193-201. The airship stations, maintained at nominally fixed locations as explained above,

frequency reuse higher than other communications systems, but with latency and link data rates comparable to ground-based systems. The beam sizes, number of beams per airship payload, and ability to customize the footprint relative to satellites will allow the Elefante Group system to target areas of interest with higher capacity density and more granular coverage. The Elefante Group airships will be able to cover a broad area persistently as compared to other terrestrial or aerial wireless solutions with minimal infrastructure requirements.

To achieve the foregoing performance objectives, the Companies have been carefully reviewing candidate spectrum bands based on an analysis that considers many factors, including the available equipment component base, atmospheric propagation characteristics, prospects for operational compatibility with incumbent and planned users, and platform and payload size, weight and power (“SWaP”). The candidate selection analysis also accounts for the fact that the planned stratospheric platform communications fall within the Fixed Services given the persistent operation of the airships at nominally fixed locations, the fixed location of user ground stations, and the fixed location of gateway terminals.<sup>6</sup> The Companies are designing for spectral efficiency and compatibility from the outset and are optimizing system architecture to derive additional uses of already encumbered spectrum and thereby maximize spectrum utilization

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will principally operate as routers and/or switches. (In supporting IoT-enabled solutions, the payloads may include sensors, imaging, and other monitoring devices generating data on board the airships which is then transmitted to user terminals or the gateway stations.) The Elefante Group airships will also have separate requirements for inter-airship cross-links and command and control communications.

<sup>6</sup> Elefante Group, with the support of Lockheed Martin, continues to examine what waivers or changes to technical and operational regulations for Fixed Services would be necessary to accommodate its stratospheric platform solutions. For example, promoting broadband deployment using stratospheric systems will benefit tremendously from larger bandwidths than the current Fixed Services rules contemplate. Elefante Group intends to share the results of its consideration of these issues in the near future.

based on compatibility studies and collaboration with incumbents.<sup>7</sup> The Companies are currently focusing primarily on candidate bands between 21 and 28 GHz as these appear to hold the best promise based on SWaP trades and the nature of existing and planned uses to enable efficient low-latency, high capacity communications between user terminals and platforms, but they continue to examine other lower and higher bands as well. In keeping with the scope of the *Spectrum Frontiers* proceeding, these Comments will address the primary candidate band above 24 GHz.<sup>8</sup>

## II. DISCUSSION

In the *Spectrum Frontiers* proceeding to date, the Commission has designated over 5.5 gigahertz of spectrum for the Upper Microwave Flexible Use Service or “UMFUS.” In the orders accompanying the *Second FNPRM*, the Commission identified four gigahertz of spectrum as “core” satellite spectrum. These actions are in addition to steps taken or being considered in other proceedings to make more spectrum available or enhance the use of existing allocations for ground-based mobile and fixed systems for 5G and for the Fixed Satellite Service. Elefante Group urges the Commission to also take steps to enable the deployment of airborne platforms, and stratospheric-based communications platforms in particular, to complement the abilities of

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<sup>7</sup> Elefante Group wholeheartedly supports forward-looking spectrum management initiatives that foster collaborative spectrum use by exploiting technologies and systems that permit more dynamic spectrum access in a way that is mutually advantageous to multiple services. Elefante Group is investing significantly to explore and develop collaborative approaches to spectrum use that enable stratospheric communications systems to operate compatibly in the same spectrum bands as ground-based fixed and mobile radio services, aeronautical mobile services, and satellite systems, as well as passive services such as earth exploration satellite services, space research, and radio astronomy.

<sup>8</sup> In the *Mid-Band Spectrum* proceeding, the Elefante Group discussed the prospects for operation of stratospheric airborne communications solutions in certain frequency bands below 24 GHz, specifically in the 17.8-20.2 and 22.5-23.6 GHz bands, noting that the Companies continued to explore other candidate bands. *Elefante Group Mid-Band Spectrum Comments* at 12-13. At the present time, based on the Companies’ further inquiries and analyses, the most promising candidate bands are 21.4-24.0 GHz and 25.25-27.5 GHz bands.

these ground-based and satellite systems. If the Commission fails to accommodate access by persistent stratospheric communications systems in adequate and appropriate frequencies, the Commission runs the risk of depriving providers, and more importantly, consumers at all levels, of a key pillar of tomorrow's wireless broadband solutions.

The *Second FNPRM* inquires whether there are “additional millimeter wave bands that the Commission should consider for flexible terrestrial wireless use, which have not been raised in the proceeding thus far.”<sup>9</sup> In response, the Elefante Group wishes to identify the 25.25-27.5 GHz band as a key candidate for stratospheric communication systems.

Notably, on the 2019 World Radiocommunication Conference (“WRC-19”) agenda, Item 1.14, the larger 24.25-27.5 GHz band is being considered in Region 2, which includes the United States, for High Altitude Platform Stations or “HAPS,” a type of stratospheric platform communication system.<sup>10</sup> HAPS, by definition, operate between 20 and 50 km.<sup>11</sup> The Elefante Group, by contrast, plans to deploy its airships at an altitude of approximately 19.5 km for greatest operational efficiency.<sup>12</sup> Stratospheric communications systems, both those operating at

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<sup>9</sup> *Second FNPRM*, ¶ 109.

<sup>10</sup> ITU, World Radiocommunication Conference 2019 (WRC-19) Agenda and Relevant Resolutions, at 35, Agenda Item 1.14 (WRC-19) and Resolution 160 (WRC-15) (revised 15 August 2017), available at [www.itu.int/go/wrc-19](http://www.itu.int/go/wrc-19). Agenda Item 1.14 is looking at adding 21.4-22.0 and 24.25-27.5 GHz using new or existing Fixed Services allocations for HAPS in Region 2 as well as 38.0-39.5 GHz worldwide. In the *Second Report and Order* in this proceeding, the Commission recently allocated 24.25-24.50 and 24.75-25.25 GHz (collectively, the “24 GHz band”) for UMFUS. *Second Report and Order* at ¶ 22. The Companies are not focusing their analysis on the 24 GHz band, but rather on the upper 2.25 gigahertz of the candidate HAPS band, although Elefante Group's stratospheric airborne payloads will also be capable of operating in the adjacent 24 GHz UMFUS spectrum.

<sup>11</sup> See 47 C.F.R. § 2.1(c) (definition of “High Altitude Platform Stations”).

<sup>12</sup> Elefante Group and Lockheed Martin have identified this “sweet spot” taking into account the weather conditions at various altitudes based on the analysis of years of atmospheric data and the required service coverage area and projected services capacity. In contrast with higher and lower altitudes, 19.5 km offers optimal airship performance and efficiency. For this reason, Elefante Group communications payloads at this optimal altitude will fall outside the regulatory definition of HAPS.

and above 20 km (*i.e.*, HAPS) and those operating at lower altitudes (such as the Elefante Group airships), would potentially offer similar capabilities and benefits, depending upon payload, capacity, and other capabilities with which the airborne platforms are equipped. Any U.S. allocation to accommodate stratospheric platform communication systems should not be limited to HAPS *per se*, so as to not artificially require stratospheric platforms to operation at and above 20 km which would be sub-optimal, at least for certain designs. Accordingly, Elefante Group encourages the Commission to look beyond the existing or potential designations by the International Telecommunication Union (“ITU”) in establishing spectrum allocations and an appropriate regulatory framework for stratospheric systems.<sup>13</sup> Moreover, to allow stratospheric solutions to be deployed in a timely manner, the Commission should consider appropriate spectrum for national use decoupled from the timing of any international processes.<sup>14</sup> Nonetheless, the ITU’s consideration of the 24.25-27.5 GHz band for HAPS bolsters the propriety of considering the 25.25-27.5 GHz spectrum for stratospheric-based communications systems more generally, *i.e.*, including those operating below 20 km.

As noted above, to pursue the foregoing capacity objectives and corresponding spectrum needs, the Companies have been carefully reviewing candidate spectrum bands using a multi-factored analysis. Elefante Group, based on considerable technical analyses performed in conjunction with Lockheed Martin, submits that, of bands above 24 GHz, the 25.25-27.5 GHz band is the most promising band to support the Elefante Group airships’ communications

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<sup>13</sup> The United States (like all nations) retain the flexibility to make spectrum available for stratospheric systems within their borders without being limited to such designations.

<sup>14</sup> Indeed, the Commission has proceeded in the *Spectrum Frontiers* proceeding independently of analogous consideration of spectrum for 5G in the millimeter wave bands.

requirements as part of an initial deployment.<sup>15</sup> Ideally this spectrum could be utilized most efficiently and with the most favorable SWaP if coupled with the nearby spectrum in the range 21.4-24.0 GHz; which would enable Elefante Group to meet its performance requirements, while also allowing for the coordinated operation in the designated spectrum of multiple stratospheric communications systems serving the same geographic area.<sup>16</sup>

The 25.25-25.75 GHz band currently is allocated on a primary basis principally to federal government use. The Federal Fixed, Inter-satellite,<sup>17</sup> and Mobile services have access to the entire range on a primary basis whereas the Earth Exploration Satellite (space-to-Earth) (“EESS”) and Space Research (space-to-Earth) services have primary access in the 25.5-27.5 GHz range.<sup>18</sup> Based on the Companies’ analysis to date which they continue to refine and validate, they are very optimistic that Elefante Group can achieve its objectives of compatible stratospheric operations without causing harmful interference (based on a risk-based analysis) to existing Federal aeronautical mobile service downlinks operating in the 25.5-27.5 GHz band. Further, the Companies’ preliminary compatibility analyses provide strong indication that any

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<sup>15</sup> In addition, stratospheric deployment of spectrum on platforms such as Elefante Group’s airships, whether in conjunction with or in lieu of ground-based terrestrial build-outs, could play a key role in allowing geographic licensees to quickly make use of their spectrum – as an initial deployment or a coordinated overlay – and should be an option for such licensees in bands below, as well as above, 24 GHz, including the UMFUS bands. In response to the Commission’s inquiry in the *Notice* whether it “should grant additional flexibility to incumbent licensees to promote more efficient use of a given band,” Elefante Group submits that, where such flexibility does not already exist in the rules for terrestrial, granting licensees the ability to deploying spectrum using stratospheric solutions, through rule changes or waivers, would allow the licensees to make much more intensive use of their spectrum by taking advantage of spatial differentiation and self-coordination.

<sup>16</sup> Elefante Group described considerations surrounding use of the 22.0-24.0 GHz bands for stratospheric platform communications systems in its *Mid-Band Spectrum Comments* at 13 & note 20. The Companies continue to examine these frequencies and have expanded their analysis to consider spectrally compatible operations in the 21.4-22.0 GHz band (which, as noted above, is being considered for HAPS by WRC-19) as well.

<sup>17</sup> The Inter-Satellite Service in this range is limited to space research and Earth exploration-satellite applications. 47 C.F.R. §2.106, note 5.536.

<sup>18</sup> 47 C.F.R. §2.106.

potential for harmful interference from Elefante Group airship-user terminal links to NASA downlinks from EESS geostationary satellites or to TDRS inter-satellite links operating in this frequency range, to the extent it exists, can be effectively managed.<sup>19</sup> In short, the 25.25-27.5 GHz band provides an excellent candidate for consideration to meet the needs for stratospheric platform communication systems in the United States and to allow them to play a vital and unique part of the next generation broadband solutions in this country.

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<sup>19</sup> Based on their analyses to date, the Companies expect that the Elefante Group communications payloads operating in the 25.25-27.5 GHz band would not require any modifications to the current operations of the incumbent users. Elefante Group will continue its compatibility studies in both the 25.25-27.5 GHz and other leading candidate bands and anticipates shortly engaging the relevant federal agencies and other stakeholders directly to discuss the prospects and means of compatible operation by stratospheric platform communication systems.

### III. CONCLUSION

For the foregoing reasons, the Commission should take steps to ensure that next generation networks can achieve their full potential and maximize the benefits of the spectrum for consumers, businesses, enterprises, institutions, and government alike. Stratospheric solutions will be a critical component of enhanced 4G and 5G networks as well as roll out of pervasive IoT-solutions in an era of connected machines and devices. In order to promote and facilitate this future, the Commission should take steps to accommodate highly spectrally efficient stratospheric-based communications systems within the range 25.25-27.5 GHz, as well as other spectrum bands, as described herein.

Respectfully submitted,

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