Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
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Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz	)	GN Docket No. 17-183
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	)	

COMMENTS OF CTIA

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I. INTRODUCTION AND SUMMARY.

CTIA[1] commends the Commission for launching the *Mid-Band NOI* and examining new opportunities in spectrum bands between 3.7 and 24 GHz ("mid-band spectrum") for flexible-use wireless services.[2] CTIA has long advocated for a mix of low-, mid-, and high-band spectrum to meet ever-increasing consumer demand for mobile broadband, emerging opportunities for the Internet of Things, and now, for next-generation 5G innovations. Across the globe, mid-band spectrum is increasingly viewed as a key component to unlocking the economic and societal

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[1] CTIA® (www.ctia.org) represents the U.S. wireless communications industry and the companies throughout the mobile ecosystem that enable Americans to lead a 21st- century connected life. The association's members include wireless carriers, device manufacturers, suppliers as well as apps and content companies. CTIA vigorously advocates at all levels of government for policies that foster continued wireless innovation and investment. The association also coordinates the industry's voluntary best practices, hosts educational events that promote the wireless industry, and co-produces the industry's leading wireless tradeshow. CTIA was founded in 1984 and is based in Washington, DC.

[2] *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017) ("*Mid-Band NOI*" or "*NOI*"); *see also* CTIA, Statement on FCC Move to Explore Mid-Band Spectrum for Wireless Use (Aug. 3, 2017), https://ctia.org/industry-data/press-releases-details/press-releases/ctia-statement-on-fcc-move-to-explore-mid-band-spectrum-for-wireless-use.

benefits of 5G connectivity. The Commission recently has taken steps to make available additional high-band spectrum in the Spectrum Frontiers proceeding and additional low-band spectrum in the broadcast incentive auction. But, as both Senate Commerce Committee Chairman John Thune (R-SD) and Commissioner Michael O'Rielly have recognized, the United States lags behind other countries in making mid-band spectrum available for mobile broadband use.[3] While licensed and unlicensed users will soon have shared access to the 3.55-3.7 GHz ("3.5 GHz" band), the experimental, three-tiered shared framework remains untested and licensed users are restricted to just 70 megahertz of the band. Through action in this proceeding, the Commission can ensure that the United States remains at the forefront of 5G spectrum policy.

With these thoughts in mind, the Commission should move quickly to a notice of proposed rulemaking that incorporates the following agenda:

- ***Employ market-oriented solutions to repurpose mid-band spectrum for flexible use***. Such solutions could include incentive auctions, band repacking, and relocation policies to transition incumbents out of reallocated spectrum and into different bands or other media.

- ***Pursue flexible-use licensing in the 3.7-4.2 GHz band***. This band shows promise for mobile broadband (*e.g.*, a large, contiguous spectrum block, advantageous propagation, and adjacency to 3.5 GHz), and current Fixed Satellite Service ("FSS") and Fixed Service ("FS") uses of the band are declining. Market-based solutions can be used to relocate FSS and FS to other bands, replace satellite or FS connections with fiber, relocate earth stations to remote locations, take advantage of new technologies, and/or provide content delivery services via 5G systems. An incentive auction and repacking process, or an overlay auction in which winning bidders negotiate with incumbents, can implement these options.

- ***Consider unlicensed use in 5.925-6.425 GHz, if incumbent uses can be protected***. CTIA is open to exploring the introduction of unlicensed services in the Lower 6 GHz band, subject to ample interference protection for existing point-to-point services

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[3] Letter from Senator John Thune, Chairman, Senate Committee on Commerce, Science and Transportation, to Chairman Ajit V. Pai, FCC (June 21, 2017); Commissioner Michael O'Rielly, *A Mid-Band Spectrum Win in the Making*, FCC Blog (July 10, 2017), https://www.fcc.gov/news-events/blog/2017/07/10/mid-band-spectrum-win-making.

based on a comprehensive, engineering-based study. Existing services must be demonstrably protected from harmful interference before new unlicensed uses are permitted.

By taking these steps to repurpose mid-band spectrum for flexible use, the Commission can help "enabl[e] innovations and investment to keep pace with technological advances" and "maintain[] U.S. leadership in deployment of next-generation services."[4]

II. THE FCC CAN EMPLOY MARKET-ORIENTED SOLUTIONS TO ENABLE THE REPURPOSING OF KEY SWATHS OF MID-BAND SPECTRUM FOR FLEXIBLE USE.

Market-oriented solutions can move mid-band spectrum to its highest use *and* enable incumbent users to maintain ongoing services by choosing alternative transmission means or finding ways to coexist. Time-tested approaches have transitioned multiple spectrum bands to new wireless uses, driving explosive growth in mobile broadband, generating enormous consumer benefits and contributions to the economy, and enabling the U.S. to become the global leader in wireless. The recent broadcast incentive auction, including the repacking of broadcast operations, is the latest example of U.S. market-based spectrum policymaking, and confirms that Congress and the Commission can structure market-oriented solutions to achieve complex spectrum repurposing.

Over two decades ago, the Commission pioneered spectrum auctions[5] and developed policies for winning bidders to fund relocation of incumbent users to comparable facilities

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[4] *Mid-Band NOI*, 32 FCC Rcd at 6374 ¶ 1.

[5] Congress provided the FCC with authority to use auctions to assign licenses for wireless services in 1993. 47 U.S.C § 309(j) (1993). Congress further amended section 309(j) in 1997 to require auctions for non-exempt mutually exclusive applications for initial licenses. 47 U.S.C. § 309(j) (1997).

(wireless or wired).[6] Auctions allow the Commission to "apply market forces to the assignment of spectrum licenses, helping to ensure that spectrum is put to its most productive use."[7] The broadcast incentive auction took the auction concept a step further, creating the first-ever two-sided spectrum market. Incentive auctions are a voluntary, market-based means of repurposing spectrum. They encourage incumbent licensees to voluntarily relinquish spectrum usage rights (the "reverse auction") in exchange for a share of the proceeds from an auction of new licenses for the repurposed spectrum (the "forward auction").[8] An incentive auction can provide existing incumbents with multiple options as part of the reverse auction, from terminating service, to exiting the band for an alternative medium or a different band, to reducing spectrum usage rights.

The broadcast incentive auction successfully used market forces to reallocate spectrum to more valued, flexible-use services, while preserving a robust broadcast service. The auction generated $19.6 billion in forward auction winning bids; repurposed 84 megahertz of spectrum for broadband; and will provide more than $10 billion to broadcasters that chose to relinquish

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[6] *See, e.g.*, *Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, First Report and Order, 7 FCC Rcd 6886 (1992); Second Report and Order, 8 FCC Rcd 6495 (1993); Third Report and Order, 8 FCC Rcd 6589 (1993); Memorandum Opinion and Order, 9 FCC Rcd 1943 (1994); Second Memorandum Opinion and Order, 9 FCC Rcd 7797 (1994); *aff'd APCO v. FCC*, 76 F.3d 395 (D.C. Cir. 1996); *Plan for Sharing the Costs of Microwave Relocation*, First Report and Order, 11 FCC Rcd 8825 (1996); Second Report and Order, 12 FCC Rcd 2705 (1997); Memorandum Opinion and Order on Reconsideration, 15 FCC Rcd 13999 (2000).

[7] *Expanding the Opportunities of Spectrum through Incentive Auctions*, Notice of Proposed Rulemaking, 27 FCC Rcd 12357, 12367 ¶ 24 (2012).

[8] *See* FCC, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN 81-82 (2010).

spectrum usage rights.[9] In addition, auction proceeds will provide capital for winning broadcast stations that will remain on the air through channel sharing or a change in channel, which they can reinvest in programming and other activities.[10] The Commission is also organizing the repack of the television band – assigning remaining TV stations to new channels in the repacked TV band – in turn freeing up spectrum for wireless communications.

Along with auctions, the Commission previously has adopted and applied relocation policies that allow new entrants to strike market-based arrangements to transition incumbent operations out of reallocated spectrum and into different bands or other media.[11] These policies include a period during which the parties must negotiate in good faith.[12] But should negotiations fail and relocation be required to avoid interference, the new entrant must guarantee payment of all relocation expenses, build the new facilities, and demonstrate that the new facilities are comparable to the old ones.[13] These rules also address cost-sharing reimbursement, to cover the scenario where relocation of an incumbent benefits more than one new entrant,[14] and they

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[9] Gary Epstein and Jean L. Kiddoo, *The Incentive Auction Clock Phase Is Over. What's Next?*, FCC Blog (Feb. 10, 2017), https://www.fcc.gov/news-events/blog/2017/02/10/incentive-auction-clock-phase-over-what%E2%80%99s-next.

[10] *See id*.

[11] *See* 47 C.F.R. § 101.69(a)(1); *see generally id*. §§ 101.69-82. Alternatively, the parties can agree to negotiate sharing arrangements. *See id*., § 101.69(a)(2).

[12] *See id*. §§ 101.69, 101.73. While the PCS relocation rules included both voluntary and mandatory negotiation periods, *see id*. §§ 101.71 (2005) (repealed), 101.73 (2005), the AWS relocation rules include only a mandatory negotiation period, *see id*. §§ 101.69(d), 101.73(a). Any application of these rules to mid-band spectrum should follow the AWS approach in order to accelerate any transition of fixed microwave services.

[13] *See id*. §§ 101.69, 101.75.

[14] *See id.* §§ 24.239-24.253, 27.1160-27.1190.

include sunset provisions.[15] These time-honored relocation procedures have been successfully used to relocate fixed microwave incumbents out of the PCS, AWS-1, and AWS-3 bands, for example.[16]

Although incumbent uses of mid-band spectrum vary, these same market-oriented principles can be used to optimize the amount of mid-band spectrum available for flexible-use licenses while still preserving incumbent use. Doing so will help unleash investment and innovation, benefit consumers, accelerate economic growth, and fortify U.S. global competitiveness.

III. THE FCC SHOULD PURSUE FLEXIBLE-USE LICENSING IN THE 3.7-4.2 GHz BAND.

A. The 3.7-4.2 GHz Band Is Promising Spectrum for Mobile Broadband, Even as Current Use of the Band Is Declining.

The 3.7-4.2 GHz band presents an important opportunity to make mid-band spectrum available for flexible-use licensing in order to meet the growing demand for mobile broadband. From a technical standpoint, the 3.7-4.2 GHz band offers promising attributes for wireless broadband in a 5G world. The band offers 500 megahertz of contiguous spectrum, sufficient to provide wider channels and more significant throughput than low-band spectrum. It has advantageous propagation characteristics to enable broad coverage with fewer facilities than high-band spectrum requires. Further, the band is adjacent to the 3.5 GHz band and the new Citizens Broadband Radio Service ("CBRS") for shared wireless broadband. By opening up 3.7-4.2 GHz for additional flexible licensed use adjacent to the 3.5 GHz CBRS band, the FCC can

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[15] *See id.* §§ 101.79, 24.253, 27.1174

[16] *See id.* §§ 24.239-24.253 (rules for relocating incumbent microwave users from the PCS band); 27.1160-27.1190 (relocation rules and policies for AWS-1 and AWS-3 bands); 101.69-101.82 (policies governing microwave relocation generally).

expand the availability of mid-band spectrum for wireless broadband and other uses, enhance the overall utility of that spectrum, attract new providers, and help drive a larger, more innovative equipment market.

Indeed, nations across the globe have taken steps to make mid-band spectrum available for mobile services. Australia, Brazil, China, the European Union, Japan, Ireland, South Korea, and the United Kingdom have all taken steps to foster 5G in the 3 GHz range.[17] For example, China has announced plans to allocate 500 megahertz of mid-band spectrum for 5G, including 300 megahertz of contiguous spectrum between 3.3-3.6 GHz, as well as an additional 200 megahertz of contiguous spectrum between 4.8-5 GHz.[18] Likewise, the United Kingdom is planning to auction parts of the 3.4-3.8 GHz bands, noting that spectrum in the 3 GHz range "has been identified as central to the rollout of 5G mobile across Europe."[19] Here in the U.S., the experimental 3.5 GHz "innovation band" is a start, but its three-tiered sharing regime remains untested and only up to 70 megahertz of the band will be available for licensed use. The U.S. should expand the amount of mid-band spectrum available for flexible-use services to maintain global leadership in wireless, including at 3.7-4.2 GHz.

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[17] *See* CTIA Petition for Rulemaking, GN Docket No. 12-354, at 5 (June 16, 2017).

[18] *See* Monica Alleven, *China Issues Plan to Use 3300-3600 MHz, 4800-5000 MHz for 5G*, FIERCEWIRELESS (June 7, 2017), http://www.fiercewireless.com/wireless/china-issues-plan-to-use-3300-3600-mhz-4800-5000-mhz-for-5g. Under this plan, 3.3-3.4 GHz in China would be limited to indoor use. *Id*.

[19] Ofcom, Ofcom Sets Rules for Mobile Spectrum Auction (Jul. 11, 2017), https://www.ofcom.org.uk/about-ofcom/latest/features-and-news/ofcom-sets-rules-for-mobile-spectrum-auction.

In addition to its technical advantages, adjacent band efficiencies, and ability to support U.S. leadership in wireless, the 3.7-4.2 GHz band also offers room to grow. While the band is allocated on a co-primary basis to FSS (space-to-Earth or satellite downlink, part of the "conventional C-band") and FS (point-to-point microwave), the band today is extremely underutilized and inefficiently used, and overall use of the band is declining.[20] In particular, FSS C-band license and renewal applications have been declining.[21] Applications for new licenses have declined from a peak of about 463 in 1989, to 90 or fewer in all but one year between 1998-2009, to 37 or fewer in each year since 2010.[22] Steady declines are also evident in new earth station registrations (from 360 in 2000 to just 6 in 2016) and license renewals (from 798 in 1992 to 0 for the last four years).[23] As one reform-minded stakeholder noted, "[t]he declining use of the band for FSS suggests that the rules and policies governing the 3700-4200 MHz band are outdated and badly in need of review."[24]

In addition, FSS rules designed to protect against interference are overprotective, contributing to the inefficient use of the band. This is due largely to the fact that earth station

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[20] *See* Broadband Access Coalition, Petition for Rulemaking, RM-11791, at 15-17 (June 21, 2017) ("BAC Petition"); Comments of the Utilities Technology Council, RM-11791, at 1 (Aug. 7, 2017) ("UTC BAC Comments").

[21] *See* BAC Petition at 15.

[22] *See id*., Ex. 3 (Fixed-Satellite Service (FSS) C-Band License and Renewal Applications (1988-2016)).

[23] *See id*. at 15 & Ex. 3.

[24] *Id*. at 15. CTIA commends the BAC for demonstrating how the 3.7-4.2 GHz band is underutilized, but supports repurposing the band to a more flexible-use, market-oriented licensing regime. *See* Comments of CTIA and Motion to Extend Reply Comment Date, RM-11791, at 6-8 (Aug. 7, 2017).

receive licensees in the band have access to much more spectrum than they use. The FCC's existing "full-band, full-arc" coordination policy adopted in the 1960s permits FSS earth stations to coordinate across the entire frequency band – all 500 megahertz – and over the entire geostationary arc, regardless of how little spectrum the earth stations plans to use and how few satellites they plan to access.[25] Indeed, a typical earth station only actually uses only a small part of the band.[26] As the Fixed Wireless Communications Coalition has observed, large amounts of spectrum shared by FS and FSS providers "go needlessly unused," and full-band, full-arc coordination by FSS "violates core principles of spectrum management and policies against warehousing."[27]

Finally, apart from existing FSS uses of 3.7-4.2 GHz, FS use of the band has also dropped over the past two decades.[28] This is primarily the result of point-to-point microwave operations migrating to fiber or other bands that do not have the same FSS earth station coordination concerns. As a result, there are fewer than 120 terrestrial point-to-point FS stations licensed across the U.S., mostly in rural areas.[29] These declining FS uses, coupled with similar trends for FSS, indicate that this important mid-band spectrum resource can and should be repurposed to higher and better uses.

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[25] *See* BAC Petition at 21-22; Fixed Wireless Communications Coalition, Inc., Petition for Rulemaking, Request for Modified Coordination Procedures in Bands Shared Between the Fixed Service and the Fixed Satellite Service, RM-11778, at 1-2, 4-5 (Oct. 11, 2016) ("FWCC 2016 Petition").

[26] *See* BAC Petition at 21-22.

[27] FWCC 2016 Petition at 1-2; *see also* UTC BAC Comments at 1.

[28] *See Mid-Band NOI*, 32 FCC Rcd at 6379 ¶ 15.

[29] *See* BAC Petition at 5.

B. Market-Based Solutions Can Clear Much of the 3.7-4.2 GHz Band for Flexible Use.

There are a number of options available for incumbent FSS satellite operators, earth station receivers, and point-to-point microwave licensees that open the door for a market-based reallocation of the 3.7-4.2 GHz band to flexible use. These include relocation of FSS and FS to other bands, replacing satellite or FS connections with fiber, relocating earth stations to remote locations, taking advantage of new technologies, and/or using 5G systems to provide content delivery services.

First, incumbent services can relocate out of the C-band to other spectrum bands. In the case of both the fixed and the fixed satellite services, the FCC has allocated additional bands that can accommodate additional traffic.

For FSS, relocation bands could include the Ku-band[30] and the Ka-band.[31] In addition to the higher throughput offered by the higher frequency satellites, Ku- and Ka-band high throughput satellites ("HTS") use multiple spot beams to enable more frequency reuse and greater overall capacity. For example, the Hughes SPACEWAY-3 satellite in the Ka-band has achieved 24 times the frequency reuse of a conventional satellite, effectively producing 12 GHz of capacity from the 500 megahertz bandwidth of each spot beam.[32] Further, the spot beams

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[30] In the Ku-band, frequencies available for relocation include the 11.7-12.7 GHz downlink band and the 13.75-14.5 GHz uplink band. Notably, the Ku-band is not shared with other services.

[31] In the Ka-band, frequencies available for relocation include the 18.3-19.3 GHz and 19.7-20.2 GHz downlink bands, and the 27.5-28.35 GHz (secondary to UMFUS), 28.35-29.1 GHz, and 29.5-30 GHz uplink bands.

[32] HUGHES, THE VIEW FROM JUPITER: HIGH-THROUGHPUT SATELLITE SYSTEMS 2 (July 2013), https://www.hughes.com/sites/hughes.com/files/2017-04/JUPITER_H50283_HR_08-01-13.pdf.

used by HTS take advantage of high antenna gain, and in turn higher transmitted signal levels, to close links to earth stations at high data rates with sufficient rain-fade margin to provide good overall link availability.[33] In addition, technologies like Adaptive Coding and Modulation ("ACM") are helping satellites in the Ku- and Ka-bands overcome rain fades.[34] Indeed, a UMTS Forum study has found that new technologies like ACM are supporting a migration from the C-band to the Ku- and Ka-bands.[35]

For point-to-point microwave, relocation bands could include 11 or 18 GHz, both of which currently permit non-federal FS uses.[36] As Ericsson has observed, there is a long-term global trend of microwave spectrum usage moving to underutilized higher frequency bands in order to access wider channels.[37]

Second, incumbent services can replace satellite or fixed connections with fiber. Delivering data traffic through fiber cables has advantages in terms of lower latency, greater capacity, enhanced security, and lower cost. Compared to satellites in particular, fiber offers security from RF interference; much greater capacity; significantly lower latency (C-band satellite signals require about 200 milliseconds of latency to travel roundtrip from the ground to a

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[33] HARRIS CAPROCK, NOT ALL BANDS ARE CREATED EQUAL: A CLOSER LOOK AT KA & KU HIGH THROUGHPUT SATELLITES 2 (2012).

[34] UMTS FORUM, STUDY ON SPECTRUM USES, TRENDS AND DEMANDS IN THE RANGE 3400-4200 MHZ (C-BAND) 2 (Apr. 22, 2014), https://cept.org/Documents/ecc-pt1/17536/ecc-pt1-14-050_study-on-spectrum-uses-trends-and-demands-in-the-range-3400-4200-mhz-c-band.

[35] *See id.*

[36] *See* 47 C.F.R. § 2.106.

[37] ERICSSON, ERICSSON MICROWAVE OUTLOOK: TRENDS AND NEEDS IN THE MICROWAVE INDUSTRY 6 (Oct. 2016), https://www.ericsson.com/assets/local/microwave-outlook/documents/ericsson-microwave-outlook-report-2016.pdf.

geostationary satellite); and improved economics compared to the high cost of deploying and maintaining satellites. Moreover, fiber is becoming more and more available, as a recent study by the University of Wisconsin and others indicates.[38] According to that study, there are dense deployments of long-haul fiber in the northeast and coastal areas, with interconnection through long-haul hubs located at interior population centers in the United States.[39]

Third, earth station operations can relocate to remote locations. Specifically, earth station operations – particularly multi-hub "antenna farms" – can relocate to remote locations and be protected from interference, and can use fiber to connect to existing earth station locations. This approach is already used for major teleport services offered by satellite operators, and a similar approach could be used for single earth stations or cable head-ends. As but one example, Intelsat uses teleport facilities that are typically located between 20 to 80 miles from major cities.[40] Keeping the teleport/head-end facility away from the major population areas will help to prevent interference between wireless broadband operations and FSS earth stations.

Fourth, incumbents can take advantage of the latest technologies. Application of compression technologies could allow satellite traffic to be combined into a smaller number of transponders, thus freeing up a portion of the band for use by broadband service providers. For example, if content carried on two separate 36 megahertz transponders is compressed into a single transponder, then 36 megahertz would become available for flexible use licensing.

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[38] RAMAKRISHNAN DURAIRAJAN, UNIVERSITY OF WISCONSIN, ET AL., INTERTUBES: A STUDY OF THE US LONG-HAUL FIBER-OPTIC INFRASTRUCTURE § 2.5 (2015), http://pages.cs.wisc.edu/~pb/tubes_final.pdf.

[39] *Id*.

[40] *See* Intelsat, IntelsatOne Teleports, http://www.intelsat.com/global-network/intelsatone/teleports/ (last visited Oct. 2, 2017).

Fifth, 5G systems can be used to provide content delivery services. New mobile broadband entrants in the band will necessarily have some type of backhaul communication capability, which could be used to provide content delivery services in lieu of satellite operations. For example, a wireless carrier may extend the reach of fiber links in order to provide backhaul capabilities for its base stations that are distributed throughout its service area. Such a fiber network could be capable of providing content delivery to cable head-ends and replace earth stations that are currently used for content distribution.

* * *

To implement these options, the Commission should consider using an incentive auction and repacking process. An incentive auction would permit satellite operators, earth station licensees, and microwave licensees to monetize existing spectrum usage rights by choosing from the solutions above or others to clear the band. The recent broadcast incentive auction included a reverse auction (to determine which broadcasters would voluntarily give up spectrum usage rights and at what price) and a forward auction (to determine the price bidders were willing to pay for repurposed, flexible-use spectrum).

In the 3.7-4.2 GHz band, satellite operators, earth station licensees, and microwave licensees all could participate in a reverse auction and choose from among several options including, for example, vacating the band for another or a fiber alternative; limiting operations to a smaller swath of spectrum; or moving to a more remote location. A forward auction would next generate the revenues from new entrants to support the reverse auction results. A repack would then move remaining incumbents into a portion of the 3.7-4.2 GHz band and to more remote locations, and modify the "full-band, full-arc" policy for earth station authorizations. As the Chairman has explained, repacking is the "linchpin" that made the broadcast incentive

reverse and forward auctions work; it reorganized and regrouped channels assigned to remaining broadcasters to free up contiguous spectrum blocks for flexible mobile use.[41]

Here, the Commission could address the "full band" portion of its earth station authorization policy by repacking remaining satellite operations into the upper edges of the 3.7-4.2 GHz band.[42] This would free up spectrum in the lower portion, adjacent to the 3.5 GHz band already allocated for CBRS flexible use. Incumbent earth station operations could also be moved to more remote locations, eliminating interference risks in more populated, heavier-trafficked areas. In addition, the Commission could modify the "full arc" policy by repacking specific satellite traffic where feasible. By moving remaining satellite traffic to satellites in orbital slots that are higher in the geostationary arc from the viewpoint of the FSS earth-station, the receive antennas will be pointed higher into the sky. As a result, the arc to be protected would be narrowed as earth station receive antennas would be pointed upward and not towards the horizon. There would thus be sufficient antenna discrimination between the earth stations and new, flexible-use terrestrial operations to enable co-existence and more intensive use of the band.[43]

Alternatively, the Commission can consider an overlay auction in which winning bidders negotiate with incumbents in the licensed area. Overlay rights would allow new licensees flexibility in use, subject to noninterference and the right to negotiate with incumbent licensees.

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[41] *See* Commissioner Ajit Pai, FCC, *Opening Remarks at CTIA's 2013 Panel on the Spectrum Incentive Auctions: Step Right Up!*, Las Vegas, Nevada (May 22, 2013), https://apps.fcc.gov/edocs_public/attachmatch/DOC-321172A1.pdf.

[42] *See* UTC BAC Comments at 1 (advocating that the Commission "eliminate the 'full-band, full-arc' scheme for licensing FSS in the 4 GHz band").

[43] The FCC could also permit any new earth stations or point-to-point operations on a secondary basis only.

Allowing the winning bidders to negotiate directly with incumbents allows solutions to be tailored to the unique circumstances of the particular market. It also allows the flexibility to pioneer unique solutions that can be mutually beneficial to both the incumbent and to the incoming broadband service provider. The Commission has successfully applied overlay licensing, combined with mechanisms to relocate incumbent users, in the PCS, AWS-1, and AWS-3 bands.[44]

IV. CTIA IS OPEN TO THE FCC INVESTIGATING WHETHER UNLICENSED CAN CO-EXIST WITH INCUMBENT POINT-TO-POINT OPERATIONS IN 5.925-6.425 GHz, SUBJECT TO A SHOWING OF AMPLE INTERFERENCE PROTECTION BASED ON A COMPREHENSIVE, ENGINEERING-BASED STUDY.

CTIA recognizes there is significant interest in enabling unlicensed operations in the 5.925-6.425 GHz ("Lower 6 GHz") band and is open to investigating whether unlicensed operations can protect incumbent operations – in particular, fixed point-to-point microwave operations. Today, the Lower 6 GHz band is heavily used for FS point-to-point microwave links. One reason for this heavy use is that the Lower 6 GHz band was the primary relocation band for 2 GHz microwave licensees who moved their operations to make way for PCS in the 1990s.[45] According to the FCC's licensing records, more than 27,000 licenses for point-to-point

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[44] *See Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Notice of Proposed Rulemaking, 30 FCC Rcd 11878, 11909 ¶ 97 (2016) (citing 47 C.F.R. §§ 24.239-24.253, 27.1111, 27.1160-27.1190).

[45] *See Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies*, Second Report and Order, 8 FCC Rcd 6495, 6506 ¶ 28 (1993).

operations have been issued in the band.[46] These licenses support a variety of important services, including public safety, critical infrastructure, and commercial backhaul.[47]

Given these important existing uses, it is imperative that parties seeking to use this band for unlicensed use provide a comprehensive, engineering-based demonstration that any interference protection solution can, in fact, protect point-to-point operations from interference. The *NOI* explains, "[u]nlicensed devices would need to protect the licensed services" that operate in the 5.925-6.425 GHz band, and "avoid causing interference to FS licensees."[48] CTIA agrees that proponents of unlicensed operations in this band have the burden to demonstrate that proposed use would not cause interference to FS licensees. An engineering-based demonstration should involve testing, engineering analyses, and FCC workshops to foster an open dialogue on whether unlicensed users can adequately protect incumbent operations in the band. Subject to a showing of ample interference protection, CTIA agrees that introducing unlicensed use in the band potentially offers important benefits.

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[46] *See Mid-Band NOI*, 32 FCC Rcd at 6381-82 ¶ 25.

[47] *Id*. at 6382 ¶ 25.

[48] *Id*. at 6382-83 ¶ 29.

V. CONCLUSION.

CTIA supports efforts to deploy market-oriented solutions to enable the repurposing of key swaths of mid-band spectrum for flexible use. By initiating a rulemaking to carry out the steps recommended herein, the Commission will help continue to meet consumer demand, promote competition, and help ensure a vibrant, innovation-based mobile economy.

Respectfully submitted,

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