

**BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554**

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	)	GN Docket No. 18-122
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11791
	)	
Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service	)	RM-11778
	)	

**COMMENTS OF COMCAST CORPORATION AND NBCUNIVERSAL MEDIA, LLC**

WILLKIE FARR & GALLAGHER LLP  
1875 K Street, N.W.  
Washington, D.C. 20006  
  
*Counsel for Comcast Corporation*

Kathryn A. Zachem  
David M. Don  
Brian M. Josef  
*Regulatory Affairs,  
Comcast Corporation*

Francis M. Buono  
Ryan G. Wallach  
*Legal Regulatory Affairs,  
Comcast Corporation*

Margaret Tobey  
*Regulatory Affairs, NBCUniversal*

COMCAST NBCUNIVERSAL  
300 New Jersey Avenue, N.W.  
Suite 700  
Washington, DC 20001

October 29, 2018

## **Executive Summary**

Now is a particularly important time for spectrum policy, as greenfield spectrum for new applications is increasingly difficult, if not impossible, to find. At the same time, spectrum demand is increasing, so the Commission's efforts to allocate additional spectrum for licensed and unlicensed purposes is prudent. As the Commission looks to more intensively utilize spectrum, it should rely on a paradigm that: (1) puts unused spectrum to work; (2) puts underutilized spectrum to more efficient work; and (3) where there is intensive incumbent use, creates careful solutions to enable additional uses, while protecting consumers' use of existing services. Accordingly, as the Commission considers future reallocations, it must differentiate among unused and significantly underutilized spectrum; somewhat underutilized spectrum; and intensively used spectrum. The Commission should proceed cautiously where it looks to make intensively utilized spectrum – as is the case in the C-Band – available for new uses.

The 3.7-4.2 GHz C-Band spectrum currently plays an important role in distributing news, weather, and entertainment to hundreds of millions of American consumers. Comcast receives video via the C-Band for distribution to consumers, and for reception and distribution of video to small and midsize multichannel video programming distributors ("MVPDs"). NBC Network, Telemundo, and NBCUniversal also distribute programming via the C-Band to affiliates and headends around the country.

The C-Band's propagation characteristics, together with many years of marketplace developments supported by Commission policies, have led the video industry to coalesce around the C-Band as an ideal medium for transmitting video from studios to distribution centers, as well as for remote newsgathering operations. In many instances, the C-Band is the sole link carrying video programming from one place to another. The C-Band also is a redundant backup, consistent with longstanding Commission policies stressing the importance of redundancy to ensure that the public

retains access to critical information despite terrestrial network outages that may occur due to severe weather, fiber cuts, or other unexpected events. In all cases, the use of C-Band spectrum demonstrates remarkable efficiency, thanks to extensive and continuing technological innovations.

Given the past investment in, and importance of, the C-Band to consumers and existing users, the Commission must reject proposals to intensify terrestrial use of the C-Band absent a robust record demonstrating that existing services will be protected from new, potentially-interfering services. Since the Commission first proposed altering and expanding the use of the C-Band, Comcast and others have posed numerous questions about how existing services will be protected. Yet, the administrative record remains largely devoid of detailed answers to those questions.

To date, no one has identified a suitable alternative to C-Band satellites for delivering the video programming on which so many Americans rely, or fully described how all existing services could continue to operate and be protected from interference in a repacked band, adjacent to new terrestrial mobile services. Some have touted the potential development of new filters, but in Comcast's experience, filters are not foolproof and remain only one piece of the interference-protection puzzle. Some have suggested relocating current C-Band operations to other satellite bands, but those bands' technical characteristics and available capacity preclude them as viable substitutes. Others have suggested relocating C-Band operations to fiber, but while that may work in some areas for some providers, particularly in dense urban areas, doing so on a nationwide basis would require a monumental investment. Even if such a project were feasible, fiber cannot replicate the ubiquity and the reliability of C-Band spectrum.

Nor has anyone yet proposed an equitable way to reallocate C-Band spectrum. Much attention has focused on an untested "market-based" scheme, under which a consortium of four foreign-based satellite operators would clear a portion of the band for mobile use and pocket the proceeds. Beholden to the consortium's decisions would be the operators of tens of thousands of earth stations and millions

of American households that depend on the services that the C-Band currently provides. Supposedly, the consortium would reimburse affected earth station operators and provide them filters and “technical assistance,” but satellite operators, who almost never have a contractual relationship with earth station operators, would be motivated to short-change downstream users to maximize their windfall. And the consortium has not worked out critical implementation details that supposedly would make its proposal work. This scheme would require the Commission to abdicate its traditional role in allocating spectrum, put at risk services whose ongoing reliability it has deemed important for the public welfare, and hand the reins to entities with every incentive to cut corners. Comcast respectfully submits that the fox may not be the most appropriate guard for the henhouse.

If the Commission does move forward with a reallocation of some portion of the C-Band, protecting incumbents and downstream consumers should be its first priority, as it has been in prior spectrum reallocations. Registered earth stations should also continue to receive full-band, full-arc protection, a critical component of the current framework. The Commission and stakeholders need a robust record, including test data, to consider proposed technical rules necessary to protect both in-band and adjacent-band incumbents and to avoid harmful impacts to video distribution across the country.

As sensible as it is to take a close look at the 3.7-4.2 GHz band in its ongoing quest for new flexible use spectrum, the Commission should remain cognizant of the significant reliance on the spectrum for video distribution of all kinds to consumers. The Commission should require proponents of reallocation and sharing to prioritize meaningful, proven protections for extensive incumbent uses of the band. The C-Band is not an unoccupied or lightly-used band that can simply be fast-tracked into 5G spectrum. Proponents must provide the critical details necessary to assess the feasibility of their proposals and whether they are consistent with the Commission’s legal authority and mandate to promote the public interest.

## Table of Contents

<b>I.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>II.</b>	<b>C-BAND SATELLITE TRANSMISSIONS PLAY AN IMPORTANT ROLE IN THE VIDEO DISTRIBUTION ECOSYSTEM. ....</b>	<b>3</b>
<b>III.</b>	<b>C-BAND SATELLITE SERVICES ARE IDEALLY SUITED TO MEET THE VIDEO DISTRIBUTION NEEDS OF PROGRAMMERS, MVPDS, AND CONSUMERS, CONSISTENT WITH LONGSTANDING COMMISSION POLICIES. ....</b>	<b>5</b>
	<b>A. The Commission and the Private Sector Have Taken Significant Steps To Make the C-Band an Ideal Medium for Video Distribution to Consumers, and Investment and Innovation in the Band Continues. ....</b>	<b>5</b>
	<b>B. Using C-Band Satellites To Achieve Redundancy and Path Diversity for Operations Requiring Extremely High Reliability Is Consistent with Commission Policies for MVPDs and Others.....</b>	<b>8</b>
<b>IV.</b>	<b>PAST REALLOCATIONS OF COMPARABLE MAGNITUDE HAVE INCLUDED THOROUGH AND UNQUALIFIED PROTECTION FOR IMPORTANT INCUMBENT USES, AND THE SAME POLICY SHOULD APPLY HERE. ....</b>	<b>11</b>
<b>V.</b>	<b>A ROBUST RECORD IS REQUIRED TO ADDRESS QUESTIONS RAISED BY PROPOSALS TO INTENSIFY TERRESTRIAL USE WHILE PROTECTING INCUMBENTS, THEIR CUSTOMERS, AND CONSUMERS WHO RELY ON THESE SERVICES. ....</b>	<b>14</b>
	<b>A. Questions Remain as To How Any Method To Permit More Intensive Terrestrial Use of C-Band Spectrum Would Safeguard Consumers’ Reception of Programming. ....</b>	<b>15</b>
	<b>B. Fiber Is Not a Full Substitute for the Ubiquitous Coverage and Reliability Provided by C-Band Satellites, and Relocating FSS Services to Fiber Presents Formidable Challenges.....</b>	<b>17</b>
	<b>C. Other Satellite Bands Do Not Offer Comparable Technical Characteristics to the C-Band and Lack Sufficient Capacity To Replace It.....</b>	<b>20</b>
	<b>D. Filters May Be Inadequate To Sufficiently Protect Operations. ....</b>	<b>22</b>
	<b>E. Proposals To Utilize a Secondary Market Approach Implicate Numerous Technical, Legal, Policy, and Cost Reimbursement Concerns. ....</b>	<b>23</b>
	<b>F. Auction Proposals and Hybrid Mechanisms Also Leave Many Unanswered Questions and Will Require a Closer, More Detailed Analysis.....</b>	<b>31</b>
<b>VI.</b>	<b>EARTH STATIONS SHOULD CONTINUE TO RECEIVE FULL-BAND, FULL-ARC PROTECTION.....</b>	<b>32</b>
<b>VII.</b>	<b>THERE REMAIN KEY QUESTIONS AROUND PROPOSALS TO PERMIT MORE INTENSIVE FIXED POINT-TO-MULTIPOINT USE IN THE BAND. ....</b>	<b>35</b>
<b>VIII.</b>	<b>CONCLUSION .....</b>	<b>36</b>

**BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554**

In the Matter of	)	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	)	GN Docket No. 18-122
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	
Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission’s Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band	)	RM-11791
	)	
Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service	)	RM-11778
	)	

**COMMENTS OF COMCAST CORPORATION AND NBCUNIVERSAL MEDIA, LLC**

Comcast Corporation and NBCUniversal Media, LLC (collectively, “Comcast”) hereby file these comments in response to the Order and Notice of Proposed Rulemaking (“*Notice*”) in the above-captioned docket.<sup>1</sup>

**I. INTRODUCTION**

Ensuring that there is sufficient spectrum available to help close the digital divide and to secure U.S. leadership in the next generation of wireless services is vital, and Comcast shares the Commission’s longstanding goal of promoting American consumers’ reliable access to the

---

<sup>1</sup> *Expanding Flexible Use of the 3.7 to 4.2 GHz Band, et al.*, GN Docket Nos. 18-122, et al., Order and Notice of Proposed Rulemaking, FCC 18-91 (July 13, 2018) (“*Order*” or “*Notice*,” respectively).

numerous connectivity and entertainment services they depend upon in their homes, at work, and on the go. Good spectrum policy should prioritize putting unused or significantly underutilized spectrum to work, and the Commission should be aggressive in promoting additional uses through reallocation and other means.<sup>2</sup> Where there is somewhat underutilized spectrum with more significant incumbents, the Commission may need to use more targeted measures.<sup>3</sup> Where there is intensive utilization, however, the Commission must exercise more caution in crafting creative, careful solutions to enable additional uses, while protecting existing services and American consumers who depend on such services.<sup>4</sup>

As significant as the potential for additional uses of C-Band spectrum is, it is equally important to ensure that incumbent operations are not disrupted, affecting hundreds of millions of American consumers who depend upon current C-Band services for news and entertainment. All four Commissioners have recognized that the proposals in the *Notice* and in the record present the Commission with complex legal, technical, policy, and economic questions that have not been fully addressed. These questions have significant ramifications for incumbent users of

---

<sup>2</sup> See, e.g., Letter from Rick Chessen, Chief Legal Officer & Senior Vice President, Legal & Regulatory Affairs, NCTA – The Internet & Television Association, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49 (Oct. 16, 2018) (addressing the 5.9 GHz band).

<sup>3</sup> See, e.g., *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Fourth Further Notice of Proposed Rulemaking, FCC 18-110 (Aug. 3, 2018) (addressing the 37, 39, and 47 GHz bands); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services; 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*, GN Docket No. 14-177 & WT Docket No. 10-112, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, FCC 18-73 (June 8, 2018) (addressing the 24, 26, lower 37, 37, and 42 GHz bands); *Promoting Investment in the 3550-3700 MHz Band; Petitions for Rulemaking Regarding the Citizens Broadband Radio Service*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd. 8071 (2017) (addressing the 3.5 GHz band).

<sup>4</sup> See, e.g., *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd. 6567 (2014).

C-Band spectrum and its downstream services, and, consequently, for the more than 100 million U.S. households that rely on those services. Before the Commission can make an informed decision regarding future use of the C-Band – including repurposing or sharing any of the spectrum – parties must provide detailed information on the record about the technical characteristics of any new services and how they plan to sufficiently protect incumbent video distribution operations and end users’ reception of video programming. The Commission cannot simply punt all of the questions to incumbent satellite operators and their “market-based” reallocation “commitments.”

## **II. C-BAND SATELLITE TRANSMISSIONS PLAY AN IMPORTANT ROLE IN THE VIDEO DISTRIBUTION ECOSYSTEM.**

The C-Band plays an important role in the reception and distribution of video content, including breaking news, live sports, and entertainment programming. Its longstanding history of enabling the delivery of such services and the substantial reliance interests on usage of the spectrum by programmers, broadcasters, MVPDs, equipment vendors, and end users cannot be easily duplicated. C-Band services are ubiquitous – reaching all corners of the country, including rural areas that can be hard to reach with fiber or other distribution methods. They are reliable, enable redundancy, and are affordable, which can be particularly important for smaller entities trying to reach large, geographically-dispersed audiences. The C-Band has the capacity and capability to deliver high-quality, high-resolution video. And it is less susceptible than higher frequencies, such as the Ku and Ka-bands, to rain fade and other atmospheric conditions that can impair video quality and link reliability.

Comcast utilizes hundreds of C-Band receive-only earth stations throughout the country, and receives over 80 percent of primary signals of its cable channels via C-Band satellites. Comcast Technology Solutions (“CTS”), Comcast’s wholesale video distribution business, also



relies heavily on the C-Band to uplink and downlink content to distribution partners. CTS's Headend-in-the-Sky ("HITS") service aggregates and transmits digital video programming via satellite to Comcast headends as well as smaller and often rural non-Comcast cable operators, which in turn retransmit that content to their subscribers. HITS offers more than 270 services from 39 different programming groups, reliably delivering content to approximately 300 cable operators serving approximately 900,000 subscribers across 900 cable systems, including rural cable operators – a feat unlikely to be accomplished without the ubiquity of the C-Band.

The C-Band is also heavily relied upon by programmers. For instance, the NBC Network uses the C-Band to deliver programming to affiliates in all 210 Nielsen Designated Market Areas ("DMAs"), serving 119.9 million households.<sup>5</sup> NBCUniversal also delivers video programming to approximately 2,000 MVPD headends around the country, serving 100 million households, relying extensively on C-Band satellites. Similarly, Telemundo – part of the Comcast NBCUniversal family – relies exclusively on the C-Band for distribution of programming to affiliates located in 80 DMAs serving approximately 72 million households, and distribution of programming directly to cable systems via the C-Band in 120 additional DMAs that lack an over-the-air broadcast affiliate.

---

<sup>5</sup> For historical reasons, NBC uses Ku-band satellites in distributing NBC Network programming to affiliates, but it also relies on C-Band satellites on a 24/7 basis, due to its greater reliability, for operationally necessary redundancy to ensure 24/7 reception.

### **III. C-BAND SATELLITE SERVICES ARE IDEALLY SUITED TO MEET THE VIDEO DISTRIBUTION NEEDS OF PROGRAMMERS, MVPDS, AND CONSUMERS, CONSISTENT WITH LONGSTANDING COMMISSION POLICIES.**

The C-Band is ideally suited for video distribution, and it is one of the Commission's great success stories.<sup>6</sup> The entire video distribution ecosystem has developed relying heavily on the C-Band, thanks to the band's uniquely favorable physical properties, Commission rulemakings, and substantial investment and innovation by the video and satellite industries. The ultimate beneficiaries of these smart policies and marketplace developments have been consumers, who have enjoyed highly reliable access to not only the sports and entertainment programming MVPDs provide, but also to critical breaking news and information.

#### **A. The Commission and the Private Sector Have Taken Significant Steps To Make the C-Band an Ideal Medium for Video Distribution to Consumers, and Investment and Innovation in the Band Continues.**

Innovations in programming and transmission technologies are driving continually rising demand for C-Band capacity, and there is no comparable substitute for C-Band services in many instances. Satellite technology inherently provides the ubiquitous coverage that is difficult for terrestrial delivery methods like fiber to achieve, especially for rural and remote areas, to which the provision of service using terrestrial networks is notoriously challenging. Among the various satellite bands, the C-Band is the most suitable for point-to-multipoint video distribution. C-Band spectrum is immune to rain fade and other types of atmospheric signal loss that often materially impair the reliability of services in other bands, including the Ku-band.<sup>7</sup> C-Band

---

<sup>6</sup> See Comments of Comcast Corporation and NBCUniversal Media, LLC, GN Docket No. 18-122, at 5-6 (May 31, 2018) ("Comcast-NBCUniversal Comments").

<sup>7</sup> See Comments of SES Americom, Inc., GN Docket No. 17-183, at 3 (Oct. 2, 2017) ("SES Comments") ("Only C-band satellite frequencies are capable of providing the high availability levels that video distribution customers demand. Rain fade can materially affect

satellites also use wide coverage beams, unlike in the Ka-band.<sup>8</sup> Among other things, these characteristics allow cable operators to efficiently deploy new headends in rural and remote areas relatively quickly to ensure that consumers in those areas benefit from the same video and other services available in urban centers.<sup>9</sup>

The Commission long ago recognized the importance of the C-Band to the nation's communications system,<sup>10</sup> authorizing its use and tailoring and refining its rules, including to accommodate the rapid growth and anticipated future growth and expansion of C-Band

---

satellite operations in higher frequency bands. Viewers, however, expect to receive the same picture quality whatever the weather outside.”).

<sup>8</sup> See Reply Comments of SES Americom, Inc., GN Docket No. 17-183, at 13 (Nov. 15, 2017) (“SES Americom Reply Comments”) (noting that “many Ka-band satellites are configured with spot-beams, which are not well suited for distribution of content on a nationwide basis”); International Telecommunication Union, *Sharing studies between International Mobile Telecommunication-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands in the WRC study cycle leading to WRC-15*, Report ITU-R S.2368-0, at 5 (June 2015), [https://www.itu.int/dms\\_pub/itu-r/opb/rep/R-REP-S.2368-2015-PDF-E.pdf](https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-S.2368-2015-PDF-E.pdf) (“ITU WRC-15 Report”) (“The low gaseous atmospheric absorption combined with lower attenuation due to rain enables highly reliable space-to-Earth communication links. This, taken together with the wide coverage beams possible in this band, has led to satellites in this band being an important part of the telecommunications infrastructure in many countries.”).

<sup>9</sup> See Comments of the Satellite Industry Association, GN Docket No. 18-122, at 3 (May 31, 2018) (“[S]atellite service is distance-insensitive, enabling the customer of a small cable system in Ketchikan, Alaska to receive the same programming variety and advanced functionality, including ultra-high definition service, enjoyed by a viewer in New York, Chicago, or Los Angeles.”); *id.* at 5 (warning that forcing current C-Band operations to rely exclusively on terrestrial delivery would create “a stark new divide between urban dwellers . . . and residents of less populated areas, whose service would be impaired or terminated”); *see also* Comments of Conner Media Corp., Media East, LLC, and Heritage Broadcasting, LLC, GN Docket No. 18-122, at 2 (May 31, 2018) (“There are no reasonable alternatives to C-Band satellite for the receipt of syndicated programming for rural radio stations.”); Comments of National Public Radio, Inc., GN Docket No. 18-122, at 8-9 (May 31, 2018).

<sup>10</sup> *Establishment of Domestic Communication-Satellite Facilities by Nongovernmental Entities*, Report and Order, 18 R.R.2d 1631 ¶ 12 (1970).

utilization.<sup>11</sup> The Commission's C-Band policies have promoted innovations that have led to increasingly intensive and efficient use of limited C-Band resources.

New compression techniques and other advancements have enabled satellites to carry multiple channels using a single transponder, allowing cable operators to cater to consumers' increasing demand for the higher resolutions and other advanced video features made possible by the latest technology. In fact, the industry transitioned from analog to digital signals, and now provides both Standard Definition ("SD") and High Definition ("HD") digital services within the same spectrum originally used solely for analog National Television System Committee ("NTSC") standard signals. Despite these advances and efficiencies, innovations in programming and transmission technologies are driving continually rising demand for C-Band capacity.<sup>12</sup> The Commission should recognize the need for continued robust access to the C-Band for video distribution purposes and not make decisions that would jeopardize or constrain the current and future delivery of advanced video content that consumers demand.

---

<sup>11</sup> See, e.g., *Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, Notice of Inquiry and Proposed Rulemaking, 88 F.C.C.2d 318 ¶¶ 1-2 (1981); *Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, Report and Order, 54 R.R.2d 577 (1983) (establishing two degree orbital separation in the C-Band); *Amendment of Part 25 of the Commission's Rules and Regulations to Reduce Alien Carrier Interference Between Fixed-Satellites at Reduced Orbital Spacings and to Revise Application Processing Procedures for Satellite Communication Services*, Second Report and Order and Further Notice of Proposed Rulemaking, 8 FCC Rcd. 1316 (1993) (amending technical requirements for C-Band services).

<sup>12</sup> See Comments of the American Cable Association, GN Docket No. 17-183, at 4-13 (Oct. 2, 2017) ("American Cable Association Comments") (describing the intensity of C-Band use for video distribution purposes and the scarcity of C-Band spectrum to meet increasing demand).

**B. Using C-Band Satellites To Achieve Redundancy and Path Diversity for Operations Requiring Extremely High Reliability Is Consistent with Commission Policies for MVPDs and Others.**

In many cases, cable operators rely on C-Band satellite services as the primary means of receiving video content from programmers for distribution to consumers. In other cases, cable operators receive programming on a primary basis via a fiber feed, while using C-Band delivery as a redundant feed to ensure continuity of service in the event the fiber line is damaged or otherwise compromised due to a fiber cut, switching failure, or more widespread natural disasters, all of which can affect all terrestrial communications networks in a given area. In weighing proposals for alternative uses of C-Band spectrum, the Commission should be mindful of the importance of redundancy and path diversity, consistent with its longstanding policy.

Some commenters have suggested that the use of a satellite feed to provide redundancy as a matter of operational necessity is somehow not sufficiently important to justify the use of spectrum that could also be used for other purposes.<sup>13</sup> Others have suggested that the video distribution currently accomplished via the C-Band could be entirely migrated to fiber,<sup>14</sup> seeming to suggest that “redundant” means extra or unnecessary. But redundancy is a longstanding policy supported by the public interest, namely that:

- Video programming delivery arrangements should *always* employ redundant signal paths to ensure continuity of service; and
- Redundancy is best achieved through path diversity, such that terrestrial links and satellite links are *simultaneously* available to facilitate continuity of service in the event one or the other feed is compromised.

---

<sup>13</sup> See, e.g., Reply Comments of Wayne Markis, President, Interstate Wireless, GN Docket No. 18-122, at 1 (June 15, 2018).

<sup>14</sup> See, e.g., Comments of CTIA, GN Docket No. 17-183, at 11-12 (Oct. 2, 2017) (“CTIA Comments”).

This policy is consistent with market-based incentives, as video subscribers demand highly reliable access to not just entertainment, but also important news and weather.

For operations that require redundancy, like the delivery of video programming, longstanding Commission policy favors using a mix of terrestrial and satellite pathways, while discouraging the use of only a single transmission medium, such as fiber, especially given that “[s]atellite systems . . . are generally immune from natural disasters and therefore may provide critical redundancy in the event that terrestrial wireline or wireless infrastructure is compromised.”<sup>15</sup> Indeed, ensuring that satellite and fiber are used “in tandem” with each other to ensure path diversity and “standby service restoration capacity” has been a recurring theme in the Commission’s decisions for decades.<sup>16</sup>

In the wake of the September 11, 2001 terrorist attacks, the Commission, recognizing the important role video services play in conveying critical information to the public, convened the

---

<sup>15</sup> *Review of the Emergency Alert System*, Second Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd. 13275 ¶ 31 (2007).

<sup>16</sup> *See, e.g., Second Annual Report and Analysis of Competitive Market Conditions with Respect to Domestic and International Satellite Communications Services*, Second Report, 23 FCC Rcd. 15170 ¶ 54 (2008) (noting that satellite transponder capacity is often “used in tandem with fiber optic cables to provide path redundancy for highly critical telecommunications services, i.e., telecommunications traffic that for business or security reasons cannot be disrupted, or used as standby service restoration capacity”); *Policy to Be Followed in Future Licensing of Facilities for Overseas Communications*, Further Statement of Policy and Guidelines, 62 F.C.C.2d 451 ¶ 21 (1976) (recognizing “[t]he need to consider such interrelated factors as diversity, redundancy, restoration and other means to provide continuity of service within the context of the operational structure and varying economic and other incentives”); *The Inquiry into Policy to Be Followed in Future Licensing of Facilities for Overseas Communications*, Statement of Policy and Guidelines, 30 F.C.C.2d 571 ¶ 7 (1971) (finding that “the public interest . . . requires that we authorize the most modern and effective facilities available via both cable and satellite technology with due regard for *efficiency, economy, diversity and redundancy*”) (emphasis added); *Authorized Entities and Authorized Users Under the Communications Satellite Act of 1962*, Memorandum Opinion and Statement of Policy, 4 F.C.C.2d 421 ¶ 34 (1966) (noting that “major users, require redundancy and diversity in their facilities and thus would normally be expected to use a combination of terrestrial and satellite facilities to the same points to provide such redundancy”).

Media and Security Reliability Council (“MSRC”) to develop best practices “to assure the optimal reliability, robustness and security of the broadcast and multichannel video programming distribution industries.”<sup>17</sup> The MSRC’s 2004 recommendations stress the importance of both “redundant communications” and “redundant facilities” for video distribution.<sup>18</sup> For cable systems in particular, the MSRC recommended that: “[c]able systems should have redundant signal routes as far out in their network as economically practical”; “[c]able systems should have backup satellite receivers for their major news and information channels”; and “[c]able operators should take appropriate measures to provide redundant and geographically diverse equipment for their headend, hub and plant facilities, appropriate to the system’s operations and facilities.”<sup>19</sup> The MSRC also made equivalent redundancy recommendations for national and local television networks, national and local radio networks, and satellite television and radio providers.<sup>20</sup>

In encouraging redundancy, the MSRC’s recommendations reinforced existing Commission policy. The Commission has repeatedly and over many years recognized the public interest benefit in ensuring operational redundancy for video distribution.<sup>21</sup> Chairman Pai

---

<sup>17</sup> Press Release, *FCC Announces Creation of Media Security & Reliability Council; Tribune Company President Dennis Fitzsimons to be President* (Mar. 28, 2002), <http://www.mediasecurity.org/pressreleases/index.html>.

<sup>18</sup> Media Security & Reliability Council, *Comprehensive Best Practices Recommendations 2* (Mar. 2, 2004), [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-244391A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-244391A1.pdf).

<sup>19</sup> *Id.* at 9.

<sup>20</sup> *Id.* at 2-8.

<sup>21</sup> See, e.g., *EchoStar Satellite Operating Co.*, Memorandum Opinion and Order, 28 FCC Rcd. 10412 ¶ 16 (2013) (recognizing the “public interest benefit” in providing redundancy for video programming via satellite, even where those facilities are not needed to meet “immediate requirements for service,” because the redundant feed may be required to provide “service at a future date, and as circumstances develop”); *The Western Union Telegraph Company, Revisions to Tariff FCC No. 261 Pertaining to Video Channel Service*, Memorandum Opinion and Order, 67 F.C.C.2d 96 ¶¶ 16, 24 (1977) (recognizing that reliable video distribution requires

himself has stated in a related context that the Commission should strive to “incentivize providers to set up and maintain redundant pathways,” and “encourage providers to construct facilities with automatic and built-in redundancies,” rather than raise new barriers to providers that are seeking to abide by policies promoting redundancy for important communications.<sup>22</sup>

Limiting the usability of the C-Band would run counter to these longstanding policies.

**IV. PAST REALLOCATIONS OF COMPARABLE MAGNITUDE HAVE INCLUDED THOROUGH AND UNQUALIFIED PROTECTION FOR IMPORTANT INCUMBENT USES, AND THE SAME POLICY SHOULD APPLY HERE.**

Consistent with precedent and Congressional direction, the Commission must take particular care in protecting incumbent operations and end user consumers if, after careful review of a robust record, it increases the intensity of terrestrial use in the C-Band. Indeed, in directing the Commission to submit a report evaluating the feasibility of allowing terrestrial wireless services to use or share spectrum in the 3.7-4.2 GHz band, Congress mandated that such a report address how to “ensure shared licensed or unlicensed services would not cause harmful interference to Federal or non-Federal users already operating in” the band.<sup>23</sup>

Congress has historically acknowledged the need to protect incumbents and video consumers when directing the Commission to reallocate spectrum. The voluntary broadcast

---

“operational redundancy” to “make[] it extremely unlikely that a video consumer would ever be interrupted for more than a few seconds”).

<sup>22</sup> *Improving Outage Reporting for Submarine Cables and Enhanced Submarine Cable Outage Data*, Report and Order, 31 FCC Rcd. 7947, 7999 (2016) (dissenting statement of Commissioner Ajit Pai).

<sup>23</sup> Consolidated Appropriations Act, 2018, Pub. L. No. 115-141, Division P, Title VI, § 605(c)(3).



incentive auction is a prime example.<sup>24</sup> Congress prescribed a number of protections for incumbents prior to effectuating the broadcast incentive auction.

- Participation in the broadcast incentive auction was *voluntary* for the many local broadcast stations around the country.<sup>25</sup> Here, by contrast, the path the Commission appears to be pursuing would be *mandatory* for the thousands of earth stations around the country.
- Congress required the Commission to reimburse all costs reasonably incurred by involuntarily reassigned stations that had to relocate to a new channel.<sup>26</sup>
- Stations had numerous participation options, including staying on the air, relinquishing spectrum usage rights altogether, relocating to VHF, or channel-sharing with another station.
- Congress required reimbursements to address the downstream impacts on MVPDs that incurred expenses to continue to carry reassigned stations.<sup>27</sup>
- Congress set forth a specific timeline for payment of all reimbursements and established a specific fund for such reimbursements.<sup>28</sup>
- Congress required that existing coverage areas be preserved, protected all stations against an involuntary relocation from UHF to VHF, prevented Low Power Television stations from losing spectrum usage rights, and protected all stations from reassignments or relocations in the event the forward auction proceeds were insufficient.<sup>29</sup>

The Commission was careful and thorough in implementing these protections. For instance, with respect to cost reimbursement, the Commission sought comments on the

---

<sup>24</sup> See *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd. 6567 (2014).

<sup>25</sup> 47 U.S.C. § 1452(a)(1). Indeed, the legislative history underlying the Spectrum Act, which authorized the incentive auction, demonstrates that Congress took care to ensure that “nobody is being [] forced off the airwaves.” 158 Cong. Rec. H920 (daily ed. Feb. 17, 2012) (statement of Rep. Walden).

<sup>26</sup> 47 U.S.C. § 1452(b)(4)(A).

<sup>27</sup> See *id.*

<sup>28</sup> See *id.* §§ 1452(b)(4)(D), 1452(d)(1).

<sup>29</sup> See *id.* §§ 1452(b)(2)-(b)(3), (b)(5), (c)(2).

reimbursement form, and made available multiple iterations of the catalog of reimbursable expenses, in addition to hosting workshops and webinars devoted to addressing reimbursement concerns.<sup>30</sup> And each of the many protections provided were designed to ensure continuity of service for over-the-air broadcast television, upon which 10.7 million television households solely relied for video programming services, a group the Commission described as a “small but significant segment” of the population.<sup>31</sup> Here, by contrast, the record shows that more than 100 million households rely on programming delivered via the C-Band. And in this case the Commission lacks a statutory mandate to reallocate spectrum or allow additional uses that potentially could interfere with existing services. Thus, before making any of the C-Band available for more intensive terrestrial use, the Commission should take similar care in reallocating and/or sharing any spectrum in the C-Band and implement at least equal protections for consumers.

---

<sup>30</sup> *Media Bureau Seeks Comment on Draft TV Broadcast Relocation Fund Reimbursement Form*, Public Notice, 29 FCC Rcd. 11451 (2014); *Media Bureau Seeks Comment on Updates to Catalog Reimbursement Expenses*, Public Notice, 31 FCC Rcd. 11467 (2016); *Incentive Auction Task Force And Media Bureau Finalize Catalog of Reimbursement Expenses*, Public Notice, 32 FCC Rcd. 1199 (2017); *Incentive Auction Task Force and Media Bureau Update Price Ranges in Catalog of Reimbursement Expenses*, GN Docket No. 12-268, Public Notice, DA 18-662 (June 26, 2018); *Post-Auction Transition Workshop: Timelines and Deadlines*, FCC (Mar. 13, 2017), <https://www.fcc.gov/sites/default/files/workshop-presentation-03132017.pdf>; CORES Incentive Auction Financial Module; User Manual, FCC (May 18, 2017), [https://www.fcc.gov/sites/default/files/cores\\_ia\\_financial\\_module\\_user\\_guide.pdf](https://www.fcc.gov/sites/default/files/cores_ia_financial_module_user_guide.pdf).

<sup>31</sup> *Expanding the Economic Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, 27 FCC Rcd. 12357 ¶¶ 13-14 (2012).

**V. A ROBUST RECORD IS REQUIRED TO ADDRESS QUESTIONS RAISED BY PROPOSALS TO INTENSIFY TERRESTRIAL USE WHILE PROTECTING INCUMBENTS, THEIR CUSTOMERS, AND CONSUMERS WHO RELY ON THESE SERVICES.**

While there may be value in allowing additional terrestrial uses of C-Band spectrum in the future, many critical questions remain open and unanswered.<sup>32</sup> As all four Commissioners have acknowledged, such questions must be answered before authorizing any additional uses of the C-Band.<sup>33</sup> The Commission’s rulemaking discretion is not limitless when it comes to ensuring that its decisionmaking accords with and responds to legitimate concerns raised in the record.<sup>34</sup> In applying its discretion, and consistent with its duty to ensure its spectrum allocation decisions promote the public interest,<sup>35</sup> the Commission usually insists on a robust record, even

---

<sup>32</sup> See, e.g., Letter from Ross Lieberman, Senior Vice President of Government Affairs, American Cable Association, *et al.*, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 17-183 & 18-122 (June 15, 2018) (“*ACA et al. June 15 Ex Parte*”).

<sup>33</sup> See *Notice* at 1 (Statement of Chairman Ajit Pai) (noting the need to “figure out how to accommodate the needs of incumbents”); *id.* at 3 (Statement of Commissioner Michael O’Rielly) (acknowledging that “there are still many details to be worked out” as to how reallocation would work); *id.* at 5 (Statement of Commissioner Brendan Carr) (“[W]e have some challenges in bringing more intensive use to this band in the U.S., including long-standing incumbent operations.”); *id.* at 6 (Statement of Commissioner Jessica Rosenworcel (“This [reallocation] proposal is creative. But it also raises challenging questions that this agency must tackle to fulfill our statutory obligations.”)).

<sup>34</sup> See *Motor Vehicle Mfrs. Ass’n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (holding that an agency rule would be arbitrary and capricious under 5 U.S.C. § 706(2)(A) where the agency has “entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise”).

<sup>35</sup> See 47 U.S.C. §§ 307(a), 316(a)(1).

in resolving much narrower and less consequential spectrum policy matters.<sup>36</sup> Here, the public interest demands a particularly robust record and even more rigorous evidence-based review to support any significant restructuring of the heavily-used C-Band spectrum on which more than 100 million U.S. households rely for news and entertainment programming.

**A. Questions Remain as To How Any Method To Permit More Intensive Terrestrial Use of C-Band Spectrum Would Safeguard Consumers' Reception of Programming.**

The Commission raises a range of important implementation questions that proponents of any plan to introduce new services into the C-Band must clearly answer.<sup>37</sup> As a threshold matter, the Commission correctly concludes that co-channel sharing with mobile uses is not feasible for

---

<sup>36</sup> See, e.g., *FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service that Share Terrestrial Spectrum, et al.*, Second Report and Order, 17 FCC Rcd. 2002 ¶ 10 (2002) (after seeking and receiving comment on a proposal to limit FSS earth station interference protection to frequencies used within a certain time period, terminating consideration of that proposal “because we conclude that the record is not sufficiently developed to permit us to issue rules to address them”); *Amendment of Part 101 of the Commission’s Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Service and Operational Fixed Microwave Licensees, et al.*, Report and Order, Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order, 26 FCC Rcd. 11614 ¶¶ 61-63 (2011) (after seeking comment through an NPRM, declining to allow the use of auxiliary stations in FS bands, because “there is an insufficient record for us to conclude that auxiliary stations can coexist with existing microwave operations without causing interference”); *Proposed Amendments to the Service Rules Governing the Public Safety Narrowband Operations in the 769-775/799-805 MHz Bands, et al.*, Seventh Report and Order and Notice of Proposed Rulemaking, 28 FCC Rcd. 4783 ¶ 28 (2013) (after seeking comment through an NPRM, declining to relax maximum power limits “because there is insufficient record evidence (a) that [the] proposed changes could be implemented without increasing the potential for adjacent channel interference, and (b) that the changes are necessary to achieve greater spectrum efficiency in the band”); see also *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, First Report and Order and Further Notice of Proposed Rulemaking, 14 FCC Rcd. 4761 ¶ 64 (1999) (after seeking comment, finding the record insufficient to address certain “long-term spectrum compatibility issues,” and accordingly adopting a Further Notice to resolve those issues).

<sup>37</sup> Notice ¶ 29.

C-Band FSS operations.<sup>38</sup> The Commission appropriately recognizes that the exclusion zones required to protect incumbent operations from harmful interference from mobile wireless use would mean that very little spectrum would actually be usable.<sup>39</sup>

At the same time, proponents of repacking existing C-Band users into a smaller portion of spectrum must address how this reduction in the amount of available spectrum would affect ongoing video distribution operations, and how any negative effects would be mitigated.<sup>40</sup> For instance, Comcast currently utilizes transponders on multiple satellites across the full band to provide its customers the programming they have come to expect. Technical implementation challenges related to operating in less spectrum would have real-world implications for consumers. Harmful interference could result in periodic freeze framing, audio dropouts and chirps, frozen video with no audio, or even a completely blank screen.

Repacking this band would be particularly tricky given the sensitive nature of satellite signals.<sup>41</sup> Any repacking proposal would seem to require increased channel occupancy and power spectral density, increasing the risk of interference at earth stations from adjacent satellite links. Satellite operators would necessarily be constrained in their ability to reassign C-Band users to other C-Band frequencies on their satellite(s) to quickly restore service. Signal quality

---

<sup>38</sup> *Id.* ¶ 55 (stating that the Commission has come to the “conclusion that co-channel sharing is not feasible”); *see also ITU WRC-15 Report* at 32 (“[Co-channel] sharing between [mobile uses] and FSS is not feasible in the same geographical area since no minimum separation distance can be guaranteed.”).

<sup>39</sup> *Notice* ¶ 51 (“These exclusion zones would cover 83.25% of the United States population.”); *id.* ¶ 51 n.97 (acknowledging that this 83.25% figure likely dramatically understates the reality, because it relies on a significant underestimation of the number of earth stations currently in operation).

<sup>40</sup> *See* Letter from Brian M. Josef, Comcast Corp., to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 17-183 & 18-122 (May 10, 2018) (“*Comcast May 10 Ex Parte*”).

<sup>41</sup> Comcast-NBCUniversal Comments at 10-11.

degradation of even a few tenths of a decibel can increase transmission errors by an order of magnitude, falling well below maximum tolerable bit error rate thresholds. And even a few more tenths of a decibel could lead to total failure. In addition, the higher-order modulation and coding schemes needed to provide the higher bit rates to efficiently accommodate the advanced video formats consumers are now increasingly demanding, like High Dynamic Range (“HDR”) and Ultra High Definition (“UHD”), are even more sensitive to interference, requiring higher signal-to-noise ratios to meet bit error rate requirements. Moreover, with reduced bandwidth allocated to FSS services, instances of multiple carriers sharing a single transponder would likely have to increase, in turn, increasing the risk of intermodulation interference or requiring additional transponder input back-offs. Such an approach also would decrease spectrum efficiency by reducing the size of statistical multiplexing and resource pools that lower average video bit rate requirements. To date, none of these issues have been adequately addressed in the record.

**B. Fiber Is Not a Full Substitute for the Ubiquitous Coverage and Reliability Provided by C-Band Satellites, and Relocating FSS Services to Fiber Presents Formidable Challenges.**

Underlying some reallocation proposals is the assumption that fiber can serve as a *replacement* for some or all of the C-Band services today,<sup>42</sup> even though current video distribution networks that employ fiber typically do so as a *complement* to continued satellite distribution. For example, CTIA has stated that “incumbent [C-Band] services can replace satellite or fixed connections with fiber,” but provided no data to support that claim, instead supplying data showing that fiber is today “more available” than it was at some undefined point

---

<sup>42</sup> See, e.g., Comments of T-Mobile USA, Inc., GN Docket No. 17-183, at 15 (Oct. 2, 2017); Comments of Verizon, GN Docket No. 17-183, at 18 (Oct. 2, 2017); Comments of Ericsson, GN Docket No. 17-183, at 7 (Oct. 2, 2017).

in the past, a truism that is irrelevant to whether fiber can replace C-Band’s ubiquitous services.<sup>43</sup> The *Notice* appears to subscribe to this hypothesis, despite a lack of substantive record evidence to support it.<sup>44</sup>

Understanding how C-Band-based services work today calls into question the viability of relying on fiber to replace these satellite services. To meet current consumer demand for video delivery, vast amounts of new fiber would have to be deployed, not only to locations that currently have *no* fiber access but also costly redundant fiber runs for *each* headend currently relying on C-Band services, with each taking different routes to ensure path diversity. That would be a monumental and time-consuming undertaking, particularly in rural and remote areas with little or no fiber today, and would likely be prohibitively expensive in many areas.

C-Band satellites today cover *100 percent* of the United States on an efficient point-to-multi-point basis.<sup>45</sup> By comparison, while fiber is prevalent in many urban centers, the nationwide point-to-point fiber footprint comes nowhere close, covering only a tiny fraction of the service area of C-Band satellites and concentrating on high-population density areas, despite

---

<sup>43</sup> CTIA Comments at 11-12.

<sup>44</sup> See *Notice* ¶ 63 (suggesting that fiber is an “alternative” to the C-Band for “downstream users of FSS”). Compare *id.* ¶ 64 (referring to fiber as an “FSS substitute[]” without citing to any study or authority), with *id.* ¶ 63 n.107 (recognizing that fiber may only be a “cost-effective alternative” in “certain urban and suburban areas where fiber is widely deployed”).

<sup>45</sup> See SES, *SES-11 North America C-Band Beam*, <https://www.ses.com/our-coverage/satellites/366> (last visited Oct. 24, 2018).

extensive efforts to address the formidable barriers to fiber deployment, particularly in rural and other hard-to reach areas.<sup>46</sup>



Source: T-Mobile.<sup>47</sup>

Furthermore, even if this construction project could be realistically completed any time soon, programmers, MVPDs, and video consumers would *still* be left worse-off than they were before. That is because, as detailed above, using satellite links to provide redundancy for terrestrial links is the minimum operational best practice for keeping communications networks online,<sup>48</sup> and having redundant fiber links alone cannot provide the same reliability as satellite.

---

<sup>46</sup> See, e.g., Reply Comments of the Satellite Industry Association, GN Docket No. 17-183, at 23 (Nov. 15, 2017) (“SIA Reply Comments”) (discussing the “blanket 50-state coverage of C-band satellites” and the impossibility of replicating that coverage with other transmission media); Comments of the Satellite Industry Association, GN Docket No. 17-183, at 2 (Oct. 2, 2017) (“SIA Comments”) (“C-band spectrum . . . allows broad coverage areas, making C-band satellite service ideal for customers such as video content providers that require . . . nationwide distribution networks.”); *Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment*, Notice of Proposed Rulemaking, Notice of Inquiry, and Request for Comment, 32 FCC Rcd. 3266 (2017); *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, Notice of Proposed Rulemaking and Notice of Inquiry, 32 FCC Rcd. 3330 (2017).

<sup>47</sup> Ramakrishnan Durairajan, et al., *InterTubes: A Study of the US Long-haul Fiber-optic Infrastructure* 5 (2015), [http://pages.cs.wisc.edu/~pb/tubes\\_final.pdf](http://pages.cs.wisc.edu/~pb/tubes_final.pdf) (cited in Comments of T-Mobile USA, Inc., GN Docket No. 17-183, at 14 n.56 (Oct. 2, 2017)). The red squares on this map indicate the location of nodes and/or cities and should not be understood as indicating areas within which fiber is ubiquitously available. *Id.* at 4.

<sup>48</sup> See SIA Comments at 15 (explaining that C-Band satellite services alone permit the delivery of video “with near-perfect reliability”) (quoting Letter from The Walt Disney Co., CBS



Programmers and their viewers also rely on the C-Band for itinerant uses and remote programming, including to report on live, breaking news and emergencies. News organizations cannot know where or when breaking news will occur, and it surely does not always occur where there is fiber.

Given these realities, in its comments in response to the *Public Notice* issued earlier this year,<sup>49</sup> Comcast raised numerous specific concerns with respect to proposals to transition current C-Band video distribution operations to fiber.<sup>50</sup> Other current users of C-Band spectrum for programming delivery have raised additional questions in the record.<sup>51</sup> To date, these questions have not been adequately addressed.

**C. Other Satellite Bands Do Not Offer Comparable Technical Characteristics to the C-Band and Lack Sufficient Capacity To Replace It.**

The *Notice* suggests that current C-Band uses could be relocated to other spectrum bands, such as the Ku-band, but such a substitution is not realistic.<sup>52</sup> As multiple commenters have pointed out, Ku-band transmissions are prone to rain fade and other forms of atmospheric interference, making that band inadequate as a substitute,<sup>53</sup> and the Ka-band is significantly more

---

Corp., Scripps Networks Interactive, Inc., 21st Century Fox, Inc., Univision Communications Inc., and Viacom Inc. to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-183, at 2 (July 24, 2017)).

<sup>49</sup> *Office of Engineering and Technology, International, and Wireless Telecommunications Bureaus Seek Comment for Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz*, GN Docket. No. 18-122, Public Notice, DA 18-446 (May 1, 2018).

<sup>50</sup> *See* Comcast-NBCUniversal Comments at 15-17.

<sup>51</sup> *See ACA et al. June 15 Ex Parte* at 2-6 (comprehensively listing 82 questions addressing 44 different issues that fall into three categories: Repacking/Arc Reduction Questions; Alternative Distribution Questions; and Sharing Questions).

<sup>52</sup> *Notice* ¶¶ 63 n.107, 107.

<sup>53</sup> *See ITU WRC-15 Report* at 5; Comments of AT&T Services, Inc., GN Docket No. 17-183, at 7 (Oct. 2, 2017); *see also* SIA Reply Comments at 19-20 (noting that the industry has

prone to rain fade than even the Ku-band.<sup>54</sup> Speculative claims that these concerns could be addressed through modulation or high output satellite technology<sup>55</sup> have been rebutted in the record by satellite operators with direct experience with how these technologies work and what sorts of problems they can and cannot solve.<sup>56</sup> Furthermore, even if the Ku-band could be considered a viable home for current C-Band services, the record indicates that there is “nowhere near” sufficient Ku-band capacity to replace C-Band operations.<sup>57</sup>

The susceptibility of the Ku-band and Ka-band to interference is a shortcoming that makes these bands poor candidates to replace C-Band uses, including for remote newsgathering

---

gravitated toward using different satellite bands according to which uses the bands’ propagation characteristics best support, and stating that “[a]ttempting to force C-band users to switch to Ku- or Ka-band satellites is the equivalent of trying to put a square peg in a round hole”); Letter from PSSI Global Services, LLC, Intelsat Corp., and SES Americom, Inc. to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 17-183, 18-122, at 2 (June 25, 2018) (noting that “PSSI recently converted eight trucks from Ku-band to C-band due to customer demand for the bandwidth characteristics and unmatched reliability of C-band,” and that PSSI’s customers refuse to rely solely on the Ku-band for video programming due to its vulnerability to rain fade).

<sup>54</sup> Gilat, *Ka Versus Ku-band: What Makes the Difference in VSAT Technology?* at 1 (May/June 2011), <https://www.gilat.com/wp-content/uploads/2017/02/KaVsKu.pdf> (“A typical Ku-band rain fade is ~1 dB/sec while the fade rate in Ka-band is significantly higher at around 3-5 dB/sec.”).

<sup>55</sup> See CTIA Comments at 11.

<sup>56</sup> See SIA Reply Comments at 20-22; SES Americom Reply Comments at 13-14.

<sup>57</sup> See, e.g., SIA Reply Comments at 20 (“Both Ku- and Ka-band satellites are in active use and have very little idle capacity.”); SES Americom Reply Comments at 13 (“Neither SES nor any other satellite operator has Ku- or Ka-band satellites that are standing vacant and ready to serve as in-orbit spares for C-band FSS networks.”); *id.* (“Any unused capacity on Ku- and Ka-band spacecraft with U.S. coverage is nowhere near enough to replace the hundreds of C-band transponders that currently serve the U.S.”); American Cable Association Comments at 16 n.30 (“ACA understands that all Ku-band transponders are full, with demand exceeding supply.”); *see also* Comments of Viasat, Inc. to Third Further Notice of Proposed Rulemaking, GN Docket No. 14-177 & WT Docket No. 10-112, at 2 (Sept. 10, 2018) (noting that “the Ka band is quickly reaching capacity”).

and on-location reporting.<sup>58</sup> Because fiber cannot accommodate itinerant uses, these feeds almost always must do without a secondary, redundant feed. Thus, in poor weather, relying solely on the Ku-band or Ka-band for critical live and late-breaking news from the field would leave producers with the choice of either subjecting viewers to spotty, pixelated, and intermittent video or foregoing altogether any on-location reporting that requires a satellite link.

**D. Filters May Be Inadequate To Sufficiently Protect Operations.**

The *Notice* also speculates that filters can be developed that will enable FSS earth stations to continue to operate adjacent to new, flexible use operations, but the Commission should not view the advent of such filters as a magic bullet.<sup>59</sup> Comcast’s experience reveals that filters are not foolproof and do not resolve all interference-protection considerations. Filters only mitigate interference rather than eliminate it. For instance, filtering may not be able to prevent the non-linear low-noise block (“LNB”) overload interference effect; too much power leaking into the FSS band can also overload sensitive LNBs. And, in some cases, the full LNB saturation margin may not be available to prevent saturation of the LNB from 5G signal interference; the LNB at some earth station locations may have less margin to saturation because they are already receiving altimeter radar emissions.

At this time, FSS providers are still developing and testing prototypes of new filters, so it remains an open question whether and to what extent they would mitigate coexistence concerns. There is a complex, multivariable tradeoff between interference into FSS receive sites and a 5G band plan and its network operating parameters. Elements of this tradeoff including antenna

---

<sup>58</sup> See *Notice* ¶ 107 (“We seek comment on Ku-band capacity as a replacement for C-Band, including as an alternative for infrequent, portable, or more temporary uses such as for breaking news or live sporting events.”).

<sup>59</sup> See *id.* ¶¶ 29, 88.

pattern, 5G Out of Band Emissions (“OOBE”) limits, filter performance, LNB performance, 5G signal modulation and coding, bandwidth power level, antenna height, and other variables like multipath reflections, and the record does not reflect attempts to grapple with this reality. Moreover, filters also have insertion loss that attenuates the level of the desired signal. Given the extremely low power signals that earth stations receive from satellites, the impact of additional reduction in signal levels should be carefully considered.

Even if effective new filters could be developed, earth station operators should not be presented with filters as the sole, “take-it-or-leave-it” option to enable continued service to consumers. Instead, operators should have a range of options that can be tailored for each earth station location. For that reason, as suggested by the Commission, incumbent earth station operators should have access to alternative reimbursement options so that they can implement a more tailored solution.<sup>60</sup>

**E.      Proposals To Utilize a Secondary Market Approach Implicate Numerous Technical, Legal, Policy, and Cost Reimbursement Concerns.**

The Commission seeks comment on an undefined, untested “market-based” reallocation scheme, under which incumbent FSS operators would voluntarily clear all or part of the band, and make that spectrum available to mobile wireless operators on a secondary market. A “Transition Facilitator” created by satellite operators would coordinate negotiations, as well as the clearing and repacking of spectrum.<sup>61</sup> Even if this approach may appear to have certain advantages, it remains fraught with unanswered technical, legal, policy, and cost reimbursement questions. Before the Commission rushes to implement an untested process, it should carefully

---

<sup>60</sup> *Id.* ¶ 29. As discussed above, stations affected by the broadcast incentive auction had numerous options to accommodate the transition while still being reimbursed for costs reasonably incurred. *See supra* Part IV.

<sup>61</sup> *See id.* ¶¶ 66-78.

consider whether such a process would be consistent with its public interest obligations.

Importantly, any solutions should be codified in the rules and not based on “commitments” or other promises.

The Commission should carefully consider whether this approach would be consistent with its legal and policy obligations. For instance, it would run counter to the public interest for the Commission to abdicate its traditional role in repurposing spectrum. It is inappropriate for one class consisting of four incumbent, non-U.S.-based,<sup>62</sup> self-interested operators who control nearly 100 percent of the C-Band capacity in the U.S. to make decisions that will have huge implications for more than 100 million American households that rely on incumbent C-Band operations.<sup>63</sup> Given the magnitude of such a non-traditional reallocation, the Commission first should request clear Congressional direction and legal authority to do so, as it did in the broadcast incentive auction. This is prudent, in contrast to giving an advance “rubber stamp” to satellite operators’ efforts to extract billions of dollars from terrestrial providers (in a process that, to date, has not been transparent), and keeping customers, earth station operators and American consumers captive to a reduced capacity C-Band.

If the Commission were to overcome these overarching concerns and adopt any kind of market-based reallocation mechanism, it should first “ensure the negotiation process accounts for the interests of *all stakeholders* that have interests in the band—from new wireless entrants to existing satellite operators to protected incumbent earth stations, from those living in rural

---

<sup>62</sup> Intelsat and SES are both headquartered in Luxembourg. Intelsat, *Office Locations and Contact Information*, <http://www.intelsat.com/contact/locations> (last visited Oct. 11, 2018); SES, *Our Offices*, <https://www.ses.com/contact-us/our-offices> (last visited Oct. 11, 2018). Eutelsat is headquartered in France. Eutelsat, *Contacts*, <https://www.eutelsat.com/en/support/contacts.html> (last visited Oct. 11, 2018). Telesat is headquartered in Canada. Telesat, *Global Headquarters*, <https://www.telesat.com/contact-us/global-headquarters> (last visited Oct. 11, 2018).

<sup>63</sup> See generally C-Band Alliance, <https://c-bandalliance.com> (last visited Oct. 11, 2018).

America to those living in cities.”<sup>64</sup> But the market-based mechanism as proposed does not appear to contemplate most stakeholders being involved. Even a current member of the C-Band Alliance has recognized that, under the market-based framework, “the interests of the most important stakeholders – i.e., the U.S. entities that rely on C-Band satellite services to support critical communications – seem to be excluded from the decisionmaking process.”<sup>65</sup>

The Commission appropriately raises the concern that some earth station operators may have no contractual relationship with the satellite operators in charge of the proposed market-based reallocation.<sup>66</sup> In fact, operators of receive-only earth stations *almost never* have any kind of contractual relationship with a satellite operator. Rather, to the extent *any* earth station operator contracts with *any* space station operator,<sup>67</sup> it is almost always the transmitting

---

<sup>64</sup> Notice ¶ 83 (emphasis added).

<sup>65</sup> *Id.* ¶ 83 n.130 (quoting Reply Comments of Eutelsat S.A., GN Docket No. 17-183, at 5 (Nov. 15, 2017)); *see also* Letter from Karis A. Hastings, Counsel for SES Americom, Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-183, at 5 (Feb. 9, 2018) (proposing that a “Managing Committee” have responsibility for “all actions to be undertaken” by the Transition Facilitator, and that the three-person committee be compromised of one SES representative, one Intelsat representative, and one representative from another satellite operator, such that *only* satellite operators would have a say in the Transition Facilitator’s decisions); Press Release, Intelsat, et al., *Intelsat, SES, Eutelsat and Telesat Establish the C-Band Alliance (CBA), A Consortium to Facilitate Clearing of Mid-Band Spectrum for 5G While Protecting U.S. Content Distribution and Data Networks*, Business Wire (Oct. 1, 2018) (stating that the new “C-Band Alliance,” comprised *solely* of satellite operators, “is designed to act as a facilitator as described in a recent [FCC] proceeding”), <https://www.businesswire.com/news/home/20180930005068/en/Intelsat-SES-Eutelsat-Telesat-Establish-C-Band-Alliance>.

<sup>66</sup> *See* Notice ¶ 77 (“If there are earth station registrants or licensees that have no contractual relationship with any of the members of the Transition Facilitator or any FSS space station operators, will that create difficulties in clearing the band during later steps in the process?”).

<sup>67</sup> In many cases, neither the transmitting earth station operator nor the receiving earth station operator is a customer of the satellite operator. Numerous “teleport service” providers, many of whom are not U.S.-based entities, contract directly with satellite operators and then lease transponder capacity to transmitting earth station operators. *See, e.g.*, Teleport Services, Globecom, <http://www.globecom.com/satellite-solutions/teleport-services> (last visited Oct. 24, 2018).

entity (of whom there are relatively few), not the receiving entity (of whom there are relatively many). Taking these realities into account, the pool of satellite operators and their customers turns out to represent a tiny sliver of the universe of C-Band users. If the Transition Facilitator were structured this way, almost all C-Band users would have no representation whatsoever.

The *Notice* rightly asks how the Commission can ensure the Transition Facilitator “appropriately protect[s], compensate[s], and ensure[s] adequate access for relevant stakeholder[s]”.<sup>68</sup> Oversight of some sort is critically important. As Commissioner Rosenworcel has pointed out, satellite operators stand poised to reap a substantial windfall, and their incentives will be far from aligned with the interests of downstream earth station operators and the consumers they serve when it comes to compensation for transition costs incurred.<sup>69</sup> Indeed, the proposed framework calls to mind the proverbial fox guarding the henhouse. Each dollar spent on protecting incumbent downstream users of the band is a dollar less received by the satellite operators in profit, thus creating incentives to cut corners. In fact, one analyst recently postulated that the total value of repurposed spectrum could theoretically be \$60-75 billion under a market-based mechanism.<sup>70</sup> And, amid a government-wide effort to focus on policies that put “America First,” including when it comes to facilitating 5G, the notion of handing the reins of mid-band spectrum clearing for 5G to entities based outside the United States and relying on

---

<sup>68</sup> *Notice* ¶ 88.

<sup>69</sup> *Id.* at 6 (Statement of Commissioner Rosenworcel).

<sup>70</sup> See Gagan Agrawal, *C-Band Spectrum Reallocation: Too Lucrative to Ignore?*, Northern Sky Research (Oct. 18, 2018), <https://www.nsr.com/c-band-spectrum-reallocation-too-lucrative-to-ignore>.

*those* parties to reallocate spectrum belonging to the American public seems to cut decidedly against the grain.<sup>71</sup>

Even assuming that the Transition Facilitator were to craft a set of adequate protections for earth station operators, questions would still remain about enforceability, and the impact of these protective measures on the viability of the market-based approach and value of the terrestrial mobile spectrum licenses. For instance:

- The proposed market-based framework appears to contemplate some combination of Commission rules, secondary market agreements between satellite operators and mobile carriers, and perhaps conditions on the licenses issued for 5G use; which of these three categories would house the relevant protections for earth station operators?
- Would an earth station operator have standing to pursue a claim based on an agreement to which it was not a party?
- If the protections were in the Commission's rules or license conditions, how would they be enforced?
- If an earth station operator were to experience debilitating interference, who would they call? The consortium? The Commission?
- Would there be ongoing monitoring of interference conditions at each and every one of the tens of thousands of earth stations? Who would be responsible for that monitoring? Who would pay for it?

In other spectrum reallocations, more deliberate and balanced approaches to compensating displaced and otherwise-burdened incumbents for their costs have addressed such incentive problems. For example, in the broadcast incentive auction, to ensure that reimbursement funding would be “allocate[d] . . . fairly across all Eligible Entities,” the Commission engaged an independent “contractor with extensive experience in television

---

<sup>71</sup> See The White House, *White House 5G Summit*, YouTube, <https://www.youtube.com/watch?v=IBbY8fvTidU>, at 24:30-24:43 (Sept. 28, 2018) (remarks of Larry Kudlow, Director of the U.S. National Economic Council) (explaining the Trump Administration's “America First, 5G First” approach to promoting 5G, which includes “put[ting] America first whenever possible”).



broadcast engineering services.”<sup>72</sup> Parties who incurred costs were responsible in the first instance for identifying which costs were “reasonabl[e]” for them to incur, and the independent contractor was then required to assess on behalf of the Commission whether reimbursement was appropriate.<sup>73</sup> Oversight by a neutral third party may have value in any C-Band reallocation too. In any event, the incentives of any Transition Facilitator must be carefully considered and accounted for, with structural mechanisms put in place to ensure these incentives cannot be acted on to the detriment of FSS earth station operators and the millions of U.S. consumers who rely on their services.

In good faith, Comcast has engaged in at least 12 in-person meetings, calls and webinars since February 2018 with proponents of the “market-based” approach to discuss their proposal. Indeed, Comcast and NBC representatives traveled to Georgia specifically to learn more information about the satellite operators’ market-based proposal. However, after more than a year since Intel and Intelsat first raised their proposal in the record, and numerous subsequent meetings, there remain many more questions than answers.<sup>74</sup> Proponents have continued to take a paternalistic attitude toward earth station operators, presenting pitches without providing detailed information and hard data to support their claims, even outside of the official FCC record.

---

<sup>72</sup> *Incentive Auction Task Force and Media Bureau Announce the Initial Reimbursement Allocation for Eligible Broadcasters and MVPDs*, Public Notice, 32 FCC Rcd. 7556, 7557 (2017).

<sup>73</sup> *Id.* at 7558; *see also Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd. 6567 ¶ 614 (2014) (“[T]his approach should ensure that broadcasters and MVPDs do not face an undue financial burden while also reducing the possibility that we allocate more funds than necessary to cover actual relocation expenses.”), *aff’d*, *Nat’l Ass’n of Broads. v. FCC*, 789 F.3d 165 (D.C. Cir. 2015).

<sup>74</sup> *See* Joint Comments of Intelsat License LLC and Intel Corporation, GN Docket No. 17-183 (Oct. 2, 2017).

The C-Band Alliance’s recent “Commitment to C-band Users” again raises more concerns than it addresses.<sup>75</sup> The “our way or the highway” approach ignores the fact that the Commission has a great deal of experience in addressing similarly complex issues, while balancing the interests of *all* parties – most importantly, the interests of the American public. The Alliance’s suggestion that the Commission is incapable of fully addressing the issues it raises to protect incumbent operations and promote the public interest<sup>76</sup> ignores the fact that Congress has entrusted spectrum allocations to the *Commission*.<sup>77</sup> The notion that only a group of private, foreign-based entities is capable of accomplishing a fair and reasonable transition for the C-Band strains credulity. The reality is that this “market-based” proposal is a wholly novel, untested, and as-yet undeveloped approach to spectrum reallocation, whereas the Commission has decades of experience crafting innovative mechanisms to make complicated undertakings work for the American public.<sup>78</sup> It is the *C-Band Alliance* that bears the burden to demonstrate *to the Commission* – through specifics rather than vague generalities and a “just trust us” proposition – that its plan would work and that it is more than simply an attempt to exploit American spectrum and raise costs on American consumers who will ultimately pay for this spectrum (through higher wireless service and higher C-Band service prices).

Finally, whether there is a hyper demand for 5G spectrum justifying such a scheme remains to be seen. The recently-completed 600 MHz broadcast incentive auction prompted

---

<sup>75</sup> See generally Letter from Jennifer D. Hindin, Wiley Rein LLP, Counsel for C-Band Alliance, to Marlene H. Dortch, Secretary, FCC, Attachment (Oct. 17, 2018).

<sup>76</sup> See *id.* at 2 (noting “Unaddressed”, “Not covered”, “Not provided”, “Unclear”, and “No longer assured” resolutions to particular issues raised in the *Notice* under any framework except the one favored by the Alliance).

<sup>77</sup> See 47 U.S.C. §§ 301, 302a, 303, 309.

<sup>78</sup> See, e.g., *supra* Part IV (discussing incumbent protections in the context of the broadcast incentive auction, the 3.5 GHz Band, and others).

aggressive bidding by only *one* major mobile wireless carrier, belying any suggestion of ravenous demand. Since the 600 MHz auction, the only other nationwide provider that purchased licenses has turned around and sold them.<sup>79</sup> And, as the Commission is well aware, there remains a significant amount of AWS-4, 700 MHz E Block, and H Block spectrum currently going unused.<sup>80</sup> Moreover, the Commission is well on its way to making available significant amounts of high- and mid-band spectrum for 5G in the near future.<sup>81</sup> This includes the 3.5 GHz Band, the rules for which the Commission very recently updated to facilitate 5G deployments.<sup>82</sup> Just the initiation of this inquiry has likely had the effect of depressing demand for 3.5 GHz spectrum.

---

<sup>79</sup> See ULS File No. 0008036917, <http://wireless2.fcc.gov/UlsApp/ApplicationSearch/applAdmin.jsp?applID=10668528> (showing a transfer of licenses from AT&T Mobility, LLC to LB License Co., LLC) (last visited Oct. 23, 2018).

<sup>80</sup> See Letter from Donald K. Stockdale, Jr., Chief, Wireless Telecommunications Bureau, to Jeffrey H. Blum, Senior Vice President & Deputy General Counsel, DISH Network LLC, at 1 (July 9, 2018).

<sup>81</sup> See, e.g., *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, Fourth Further Notice of Proposed Rulemaking, FCC 18-110 (Aug. 3, 2018); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, FCC 18-73 (June 8, 2018); *Promoting Investment in the 3550-3700 MHz Band*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd. 8071 (2017); see also *Notice* at 7 (Statement of Commissioner Jessica Rosenworcel) (noting the upcoming “blitz of proceedings” focused on reallocating spectrum, including in the 2.5 GHz, 3.5 GHz, 4.9 GHz, 5.9 GHz, 6 GHz, 12 GHz, 24 GHz, 26 GHz, 28 GHz, 32 GHz, 37 GHz, 39 GHz, 42 GHz, 47 GHz, and 50 GHz bands, among others).

<sup>82</sup> See *Promoting Investment in the 3550-3700 MHz Band*, Report and Order, GN Docket No. 17-258, FCC 18-149 (Oct. 24, 2018); See, e.g., Sue Marek, *AT&T Changes Its Tune on 5G Fixed Wireless*, SDX Central, Sept. 10, 2018, <https://www.sdxcentral.com/articles/news/att-changes-its-tune-on-5g-fixed-wireless/2018/09/> (noting AT&T’s plans to deploy LTE to be migrated to 5G using CBRS spectrum in 2019); Kyung Mun, *Industry Voices – Mun: Diffusion of Wireless Expands 5G and CBRS Market Horizons*, FierceWireless, Oct. 3, 2018, <https://www.fiercewireless.com/wireless/industry-voices-mun-diffusion-wireless-expands-5g-and-cbrs-market-horizons> (“It looks like some are already there with CBRS and 5G.”).

**F. Auction Proposals and Hybrid Mechanisms Also Leave Many Unanswered Questions and Will Require a Closer, More Detailed Analysis.**

The *Notice* also tees up a number of conceptual alternatives to the market-based approach, including an overlay auction, an incentive auction, a capacity auction, and a “hybrid approach” that combines the market-based mechanism with an incentive auction.<sup>83</sup> Each of these proposals raises its own new questions, but all of them appear to have in common one key characteristic: the tens of thousands of downstream C-Band receive-only earth station operators could be entirely at the mercy of other parties’ actions that may require them fundamentally to restructure their technical and business operations.<sup>84</sup> As discussed above, a *forced* restructuring is a stark departure from the *voluntary* incentive auction’s approach to spectrum transitions that threaten to disrupt important video delivery operations on which millions of Americans rely.<sup>85</sup> Thus, before the Commission can give serious consideration to any of these approaches, it should first resolve the concerns identified above regarding the misaligned incentives of these parties when it comes to protecting incumbent operations. The Commission should ensure that it takes full account of the fact that satellite operators and entities pursuing new flexible C-Band uses lack incentives to adequately protect earth station operators without enforceable, structural guardrails.

---

<sup>83</sup> *Notice* ¶¶ 98-115.

<sup>84</sup> *See id.* ¶ 100 (in the context of the overlay auction proposal, seeking comment on whether “earth station operators should be required to discontinue operation in some portion of the 3.7-4.2 GHz band if requested by the *overlay licensee*”) (emphasis added); *id.* ¶ 105 (in the context of the incentive auction proposal, noting the need to address *satellite operators’* incentives to relinquish spectrum); *id.* ¶ 106 (in the context of the capacity auction proposal, explaining that reverse auction bidders would be limited to “*FCC licensee[s]*”) (emphasis added); *id.* ¶ 112 (in the context of the “hybrid approach,” explaining that satellite operators would facilitate initial clearing, and proposing to deem “cleared” areas that *satellite operators* are willing to clear).

<sup>85</sup> *See supra* Part IV.

## **VI. EARTH STATIONS SHOULD CONTINUE TO RECEIVE FULL-BAND, FULL-ARC PROTECTION.**

As the Commission explores alternative uses for C-Band spectrum under any methodology, protecting incumbent operations and downstream consumers should be its first priority. The proposal to “protect incumbent earth stations from harmful interference as [the Commission] increase[s] the intensity of terrestrial use in the band” through band repacking and/or spectrum sharing is sound.<sup>86</sup> Under these high-level principles, however, lie a myriad of thorny details yet to be resolved.

Commissioner O’Rielly is correct to “question whether eliminating full-band, full-arc is feasible.”<sup>87</sup> The ability to quickly shift frequencies, azimuths, and/or elevation angles is one of the key factors that makes the C-Band as reliable as it is and that allows it to function correctly from both business and operational perspectives. Therefore, the Commission’s reexamination of the full-band, full-arc coordination policy should *not* result in the adoption of new rules that would provide earth station interference protection only for those frequencies, azimuths, elevation angles and other parameters reported in “regular (i.e., at least daily)” use.<sup>88</sup>

The Commission’s proposal, while seeking to maximize spectrum efficiency and use, does not fully acknowledge that there is already significant efficiency in the band under the existing rules. For instance, the 24 transponders typically present in a C-Band satellite each have a bandwidth of 36 megahertz, totaling 864 megahertz, in a 500 megahertz band. In other words, the band is already operating at approximately 170 percent of its allocated capacity thanks to antenna polarization and spectrum reuse. In addition, “multiple FSS incumbents transmit within

---

<sup>86</sup> Notice ¶ 27.

<sup>87</sup> *Id.* at 3 (Statement of Commissioner O’Rielly).

<sup>88</sup> *Id.* ¶ 39.

overlapping geographic boundaries.”<sup>89</sup> Moreover, satellites across the arc of orbital positions provide an aggregate capacity that multiplies the FSS band allocation itself.

In 2000, the Commission explained why the full-band, full-arc coordination policy fulfills “important operational objectives,” and these objectives are no less important today.<sup>90</sup> The Fixed Wireless Communications Coalition (“FWCC”) had filed a petition seeking a ruling that would “require FSS operators to demonstrate ‘actual need’ for the spectrum requested at the time of licensing.”<sup>91</sup> FWCC posited that this “actual need” standard would “promote efficient use of shared bands by allowing FS facilities access to frequencies that earth stations now keep idle.”<sup>92</sup> But the Commission denied FWCC’s request, finding that earth station licensees continue to rely on the full-band, full-arc policy’s flexibility to change transponders or satellites on short notice, without re-licensing, in order to meet changing operational requirements.<sup>93</sup> The Commission’s reasoning holds true today, capturing well the importance of retaining full-band, full-arc protection.

The record on this issue is robust, with content producers, TV broadcasters, radio broadcasters, MVPDs, and others having explained the importance of the full-band, full-arc protection policy in great detail.<sup>94</sup> As the Commission acknowledges, the full-band, full-arc

---

<sup>89</sup> *Id.* ¶ 10.

<sup>90</sup> *FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum*, Notice of Proposed Rulemaking, 15 FCC Rcd. 23127 ¶ 40 (2000).

<sup>91</sup> *Id.* ¶ 5.

<sup>92</sup> *Id.* ¶ 37.

<sup>93</sup> *Id.* ¶ 40.

<sup>94</sup> Comments of Content Companies, GN Docket No. 17-183, at 3 (Oct. 2, 2017) (“Content Companies Comments”); Comments of National Association of Broadcasters, GN Docket No. 17-183, at 4-5 (Oct. 2, 2017); Comments of National Public Radio, Inc., GN Docket No. 17-183, at 10-12 (Oct. 2, 2017); SIA Comments at 25-31.

policy affords FSS operational flexibility.<sup>95</sup> It is also a key underpinning of C-Band services' reliability: C-Band FSS users rely on the ability to change frequencies, azimuths, and elevation angle parameters without advance notice in the event of an unexpected transponder outage, interference event, new and end-of-life satellite transitions, and for itinerant programming needs like live sports or breaking news. The fact that, for example, an earth station does not use a particular frequency or elevation angle for a certain period of time – whether daily or longer – does not mean the potential need to quickly shift to an alternative frequency or elevation angle has subsided. To the contrary, the ability to remain agile and stay “on the air” amid such situations is precisely what makes FSS such a perfect fit for video distribution.

Under the existing full-band, full-arc approach, video distribution networks can adapt to unexpected satellite failures.<sup>96</sup> Broadcasters, programmers and MVPDs can quickly restore service using alternate arrangements on different C-Band transponders or satellites, thereby minimizing blackouts.<sup>97</sup> These are not theoretical considerations. Satellite failures have occurred due to a wide range of issues, including power bus failures, loss of telemetry, damage caused by solar flares, and battery and solar panel failures, among other things. In each case,

---

<sup>95</sup> Notice ¶ 40.

<sup>96</sup> See Comcast-NBCUniversal Comments at 11-13.

<sup>97</sup> SES Comments, GN Docket No. 17-183, at 4 (Oct. 2, 2017) (describing the June 2017 failure of the AMC-9 satellite, which required repointing earth station receive antennas toward a new satellite, and explaining that quickly reestablishing service “would have been impossible” without the “regulatory flexibility” afforded by full-band, full-arc coordination); *see also FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum*, Notice of Proposed Rulemaking, 15 FCC Red. 23127 ¶ 40 (2000) (noting that the full-band, full-arc licensing model “provid[es] earth station licensees the needed flexibility to change transponders or satellites on short notice . . . to meet changing operational requirements”).

video providers have had to make alternative arrangements for satellite delivery, which typically requires full-band, full-arc access to the C-Band.

Eliminating full-band, full-arc C-Band access also would affect the use of the C-Band to meet itinerant programming needs. For example, to cover live sports or breaking news events, the NBC network or NBC stations may require portable uplink/downlink facilities at locations that often cannot be known in advance.<sup>98</sup> This special event programming often must be distributed using alternate channels, transponders, or even satellites due to scheduling conflicts or other needs.<sup>99</sup> Full-band, full-arc access is essential to this flexibility.

## **VII. THERE REMAIN KEY QUESTIONS AROUND PROPOSALS TO PERMIT MORE INTENSIVE FIXED POINT-TO-MULTIPOINT USE IN THE BAND.**

The Commission also seeks comment on the possibility of permitting fixed wireless point-to-multi-point (“P2MP”) uses to share C-Band spectrum on a frequency-coordinated basis with incumbent FSS uses, in connection with its proposal to eliminate the full-band, full-arc coordination policy.<sup>100</sup> While the Commission rightly aims to “avoid disruption to existing operations in the band” and retain “flexibility of FSS earth stations to modify their operations in response to technical and business needs,”<sup>101</sup> eliminating the full-band, full-arc operational flexibility would undermine C-Band operations.<sup>102</sup> Before any such sharing scheme is seriously

---

<sup>98</sup> See Reply Comments of NCTA – The Internet & Television Association, GN Docket No. 17-183, at 5 (Nov. 15, 2017).

<sup>99</sup> See Comments of North American Broadcasters Association, GN Docket No. 17-183, at 5 (Sept. 29, 2017). The Ku-band is sometimes also used for satellite news gathering, but that band’s susceptibility to rain fade has made the more reliable C-Band the preferred transmission method for special events coverage. See Content Companies Comments at 4 n.7.

<sup>100</sup> Notice ¶ 116.

<sup>101</sup> *Id.*

<sup>102</sup> See *supra* Part VI-A.



considered, the record demonstrating that such sharing is possible without interfering with incumbent uses of the spectrum would have to be very robust.<sup>103</sup>

Even if the Commission does retain full-band, full-arc protection, before permitting any additional fixed terrestrial uses of the C-Band, it should still ensure that incumbent earth station operations are “fully protected.”<sup>104</sup> Proponents of P2MP use have yet to adequately demonstrate in the record that sharing is feasible while still allowing earth stations to adjust their operational parameters quickly and without advance notice in order to maintain continuity of service.<sup>105</sup> And, as Commissioner O’Rielly has observed, this challenge would be even more pronounced in a repacked band, because less available spectrum would mean a more crowded environment with fewer available alternative and interference-free frequencies, azimuths, and elevation angles.<sup>106</sup>

## VIII. CONCLUSION

The Commission is right to focus on closing the digital divide and securing global leadership in wireless services. As it considers action in this proceeding, however, it must protect incumbent C-Band users and the more than 100 million American households that rely on the C-Band to receive reliable and uninterrupted video programming. The record remains devoid of specific details or answers about whether expanded terrestrial use of the C-Band spectrum is

---

<sup>103</sup> See Comments of Edmond R. Trombley, GN Docket No. 18-122, at 2-7 (May 31, 2018) (listing numerous past FCC spectrum reallocations demonstrating that, in every case, “[i]nterference is going to happen when a weak signal system and a robust wireless system attempt to share the same spectrum”).

<sup>104</sup> Notice at 2 (Statement of Commissioner Michael O’Rielly).

<sup>105</sup> See, e.g., Comments of Ericsson, GN Docket Nos. 18-122 & 17-183, at 7-8 (May 31, 2018); Joint Comments of Intel Corp., Intelsat License LLC, and SES Americom, Inc., GN Docket No. 18-122, at 6-7 (May 31, 2018); Comments of the Satellite Industry Association, GN Docket No. 18-122, at 9 (May 31, 2018).

<sup>106</sup> See Notice at 3 (Statement of Commissioner O’Rielly) (“It is also unclear whether sharing between satellite and fixed wireless uses is compatible in bands that are likely to be congested when all satellite use is condensed into fewer frequencies.”).

feasible without interference to incumbent operations. The Commission should insist that proponents of reallocation and sharing proposals provide realistic, verifiable test results in the record that demonstrate that incumbent services will be protected from harmful interference, and clearly articulate why any proposal is consistent with the Commission's legal authority and obligation to promote the public interest.

Respectfully submitted,

COMCAST CORPORATION &  
NBCUNIVERSAL MEDIA, LLC

/s/ Kathryn A. Zachem  
Kathryn A. Zachem  
David M. Don  
Brian M. Josef  
*Regulatory Affairs,*  
*Comcast Corporation*

Francis M. Buono  
Ryan G. Wallach  
*Legal Regulatory Affairs,*  
*Comcast Corporation*

Margaret Tobey  
*Regulatory Affairs, NBCUniversal*

COMCAST NBCUNIVERSAL  
300 New Jersey Avenue, N.W.  
Suite 700  
Washington, DC 20001

WILLKIE FARR & GALLAGHER LLP  
1875 K Street, N.W.  
Washington, D.C. 20006  
  
*Counsel for Comcast Corporation*

October 29, 2018