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	)	GN Docket No. 17-183
Between 3.7 and 24 GHz	)	(Inquiry Terminated as to 3.7-4.2 GHz)
	)	
Petition for Rulemaking to Amend and Modernize	)	RM-11791
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	)	
	)	
Fixed Wireless Communications Coalition, Inc.,	)	RM-11778
Request for Modified Coordination Procedures in	)	
Bands Shared Between the Fixed Service and the	)	
Fixed Satellite Service	)	

REPLY COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

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SUMMARY

The comments in this proceeding conclusively demonstrate the benefits the ubiquitous and robust C-band fixed-satellite service ("FSS") infrastructure confers on every U.S. resident, wringing maximum utility out of each megahertz of spectrum to capitalize on the multibillion-dollar investment in space and ground station facilities. Moreover, the record establishes that no suitable alternative to C-band FSS exists. Any action to introduce new terrestrial services in the C-band must be carefully crafted to preserve the value of this indispensable satellite network. The Commission must therefore reject proposals for co-frequency sharing of FSS spectrum by terrestrial services – whether mobile or fixed point-to-multipoint ("P2MP") – and reaffirm its policies that promote flexible, efficient, competitive satellite operations.

Submissions by multiple parties provide insight into the often unappreciated role played by the C-band FSS backbone in delivering services not only enjoyed by American consumers but in many cases critical to their safety and well-being. The media industry as we know it would not exist without the broad coverage, near-perfect reliability, and distance-insensitive pricing of C-band satellite capacity used to distribute video and audio news, weather, sports, entertainment, and religious programming to dense urban centers and small, rural communities alike. The Super Bowl, the Oscars, March Madness and breaking news events arrive in our homes courtesy of nomadic C-band trucks that can be dispatched anywhere to supply a live signal. C-band satellites also provide lifeline connectivity to remote Alaskan villages, deliver emergency alerts, and support critical government operations including air traffic control and broadband communications for U.S. Navy vessels.

C-band space stations reuse spectrum to maximize efficiency, and dozens of satellites are scattered at two-degree intervals across the geostationary arc, blanketing the country with

overlapping beams that provide service 24 hours a day, 365 days a year. These satellites serve a deployed base of over 17,000 known earth stations, ranging from cable headends with multiple antennas aimed at 20 or more satellites and receiving programming from 100-plus transponders to radio affiliates with more limited bandwidth needs but which are every bit as dependent on the C-band satellite infrastructure for affordable access to content. Together these spacecraft and ground antennas represent a highly valuable, extremely flexible, and exceptionally efficient network that offers critical connections to every community in the country.

No other technology can match the performance and reach of C-band satellites. As a matter of physics, C-band frequencies are more resistant to atmospheric attenuation than Ku-band or Ka-band frequencies, a performance advantage that is essential for content distribution, especially for delivery of critical information during severe weather. Terrestrial interests who claim that rain fade issues can be readily overcome display a fundamental misunderstanding of C-band satellite operations and usage. In any event, there is insufficient available capacity on Ku- and Ka-band space stations to accommodate the services carried by C-band satellites.

Fiber networks are limited to the largest cities and cannot economically be extended to serve less populated areas, meaning that a required shift to fiber would deprive thousands of communities of access to programming and other services they receive today. Because fiber is also vulnerable to cuts, especially in emergency situations, sole reliance on fiber would compromise the reliability and resiliency of the nation's key communications infrastructure. Improvements in compression technology that allow more channels to be carried over a single transponder will not materially reduce the need for C-band FSS given demand for higher definition signals, including 4K and even 8K video services.

Both satellite and terrestrial interests recognize that attempting to introduce new terrestrial 5G services on a co-frequency, shared basis with C-band satellite use would be a recipe for disaster. The sensitivity of FSS receivers requires large separation distances – tens of kilometers or more – to prevent harmful interference. Given the ubiquitous presence of C-band earth stations, enforcing these distances would preclude new terrestrial 5G service to the vast majority of the country's population. And any degradation of C-band FSS quality due to new terrestrial systems would threaten services vital to the public interest. Thus, the risks of co-frequency sharing between FSS and terrestrial 5G far outweigh any possible benefits.

The same is true with respect to proposals to allow P2MP services in spectrum used for C-band downlinks. As a threshold matter, bands used by wireless internet service providers for terrestrial fixed broadband total more than 10 GHz, with additional options on the horizon, and there is no evidence that such entities require yet more spectrum to expand their operations to new areas. In contrast to the frequencies fixed broadband providers use today, the C-band downlink is highly encumbered by the need to protect tens of thousands of earth stations, making any meaningful P2MP deployments in this spectrum fundamentally infeasible.

Moreover, the radical restrictions on satellite operating flexibility proposed in the Notice to lay the groundwork for P2MP introduction would have a devastating effect on C-band FSS customers. Content distributors and others rely on the current full-band, full-arc earth station licensing policy to ensure they can immediately restore service in the event of an outage, and many pay a substantial premium for such protection. Full-band, full-arc licensing also allows C-band users to take advantage of competing sources of capacity, permits interference issues to be resolved, enables traffic adjustments in response to demand changes, and makes coverage of live

events possible. Terminating this critical policy would deny satellite customers the benefits of their agreements, thwart competition, and undermine service continuity and quality.

Worse still, the latitude conferred by the existing FSS regulatory framework would be replaced by onerous and unprecedented reporting and application obligations that are wholly incompatible with the functional reality of the C-band FSS ecosystem. Tens of thousands of earth station operators would be required to report in excruciating detail their specific usage characteristics, and thereafter need to seek modification of their authority for any change involving a different antenna pointing or channel assignment. These costly burdens would make rapid service restoration effectively impossible and completely stymie competition in the satellite services marketplace, undermining the unique value proposition of C-band FSS.

The Notice's proposal to make the earth station registration freeze permanent would be similarly damaging to the efficiency and vibrancy of the C-band satellite network. A myriad of circumstances could require adding or relocating satellite receive antennas, and codifying the freeze would unnecessarily block the public interest benefits stemming from the evolution and growth of the FSS infrastructure.

Thus, parties advocating for P2MP use of C-band downlink frequencies have not supplied any concrete justification for their proposals, and the measures suggested in the Notice to facilitate P2MP use would have serious detrimental effects on incumbent FSS operations. To preserve essential satellite services and avoid disrupting existing business models, the Commission must deny requests for P2MP access to C-band FSS spectrum.

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REPLY COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

The Satellite Industry Association ("SIA")[1] hereby replies to the comments of other parties in response to the Notice of Proposed Rulemaking in the above-captioned proceeding regarding the potential for permitting new terrestrial wireless services in the 3.7-4.2 GHz C-band downlink frequencies used for fixed-satellite service ("FSS") operations.[2] As discussed herein,

[1] SIA Executive Members include AT&T Services, Inc.; The Boeing Company; EchoStar Corporation; Intelsat S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; Ligado Networks; Lockheed Martin Corporation; Maxar Technologies; Northrop Grumman Corporation; OneWeb; SES Americom, Inc.; Space Exploration Technologies Corp.; Spire Global; and ViaSat Inc. SIA Associate Members include ABS US Corp.; Airbus Defense and Space, Inc.; Analytical Graphics, Inc.; Artel, LLC; Blue Origin; DataPath, Inc.; Eutelsat America Corp.; ExoAnalytic Solutions; Globalstar, Inc.; Globecomm; Glowlink Communications Technology, Inc.; HawkEye 360; Hughes; Inmarsat, Inc.; Kymeta Corporation; L3 Technologies; Panasonic Avionics Corporation; Peraton; Planet; Telesat Canada; TrustComm, Inc.; Ultisat, Inc.; and XTAR, LLC. For more information on SIA, see www.sia.org.

[2] *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Order and Notice of Proposed Rulemaking, GN Docket Nos. 18-122 *et al*. (rel. July 13, 2018) (the "Notice").

the record before the Commission confirms the importance of C-band satellite services in supplying news, weather, entertainment, sports, and public interest programming relied on by more than 100 million U.S. households; transmitting critical weather and air traffic control data; supporting essential telecommunications capabilities to remote areas, oil platforms, and ships at sea; and restoring connectivity when terrestrial facilities are damaged. Preserving this essential backbone infrastructure must therefore be a central objective of this proceeding.

To achieve that goal, the Commission must reject co-frequency sharing between FSS and terrestrial wireless systems, either mobile or fixed point-to-multipoint ("P2MP"), and reaffirm its long-standing policies guaranteeing FSS users full-band, full-arc access to C-band spectrum. Proposals to hamstring FSS operations, impose burdensome reporting and application requirements, and foreclose expansion of satellite services to new communities must also be denied, as they would thwart the efficient use of C-band frequencies, undermine competition among FSS providers, and ultimately contravene the interests of U.S. consumers in enjoying the full range of important services made available over the C-band FSS infrastructure.

I. THE RECORD OVERWHELMINGLY DEMONSTRATES THE VALUE OF C-BAND FSS TO CONSUMER WELFARE AND THE NATIONAL ECONOMY

Filings from a broad range of entities reinforce SIA's demonstration of the important role C-band FSS networks play in providing content and connectivity to residents across the nation and conclusively refute any suggestion that FSS incumbents do not fully and efficiently utilize C-band frequencies.[3]

[3] *See* Comments of the Satellite Industry Association, GN Docket No. 18-122, filed Oct. 29, 2018 ("SIA Comments") at 2-12. Unless otherwise indicated, all citations in this document that do not specify a date or docket number are to comments filed on October 29, 2018 in response to the Notice in GN Docket No. 18-122.

A. U.S. Consumers Depend on C-Band FSS for Video and Audio Programming and Other Services Essential to Public Safety and National Security

No party disputes the importance of the services supplied by the multibillion-dollar investment in C-band space and earth stations. Both distribution and contribution of video and audio content rely on the ubiquitous coverage, unmatched reliability, and distance-insensitive affordability of C-band FSS networks. Moreover, C-band FSS enables basic telecommunications in remote Alaskan villages, enhances the safety of air navigation, transmits critical weather and emergency data, and provides redundancy for terrestrial systems when they are disrupted.

As SIA and others have explained, the predominant use of C-band FSS capacity is to serve as the nationwide backbone for providing programming content enjoyed by residents of every U.S. state and territory.[4] "[N]early every American who watches television or listens to radio, whether in their home, car, or workplace relies on the ubiquitous, reliable, and high quality continuous coverage that the C-band provides throughout the country."[5]

A group of major content suppliers – CBS Corporation, Discovery, Inc., The Walt Disney Company, 21st Century Fox, Inc., Univision Communications Inc., and Viacom Inc. (together, the "Content Companies") – emphasizes that C-band FSS "ensures the reliable distribution of video programming to nearly 120 million American households, representing over 300 million people."[6] The American Cable Association ("ACA") observes that virtually all multichannel video programming distributors ("MVPDs"), "including hundreds of small and mid-sized cable

[4] *Id.* at 2-5.

[5] Comments of Cumulus Media Inc. and Westwood One, LLC ("Cumulus/Westwood One Comments") at i.

[6] Comments of the Content Companies ("Content Company Comments") at 1.

operators like ACA members, pick up video programming by means of thousands of C-band receive-only earth stations, both registered and unregistered, and then deliver it to the more than 90 million MVPD households."[7] In addition, some content providers use C-band FSS to deliver programming to over-the-top video service providers.[8] Moreover, C-band satellites continue to be employed to provide free-to-home video services, particularly to viewers "in areas

[7] Comments of the American Cable Association ("ACA Comments") at 7. *See* also Comments of Altice USA ("Altice Comments") at 2 (cable provider Altice USA "delivers its core video programming to subscribers across its 21-state service territory" using close to 150 C-band earth stations to distribute video programming to 4.9 million residential and business customers); Comments of AT&T Services, Inc. ("AT&T Comments") at 3 ("AT&T owns numerous earth stations operating in the C-band to receive video content – facilities that serve as crucial links in a network distributing that content to tens of millions of end users over AT&T's multichannel video outlets"); Comments of the C-SPAN Networks ("C-SPAN Comments") at 2 (C-SPAN relies on C-band FSS to deliver C-SPAN, C-SPAN2 and C-SPAN3 to "nearly 5,000 or more affiliated cable systems around the country in all 50 states," reaching "approximately 92.7 million television households and about 99 percent of pay television households in the U.S."); Comments of Charter Communications Inc. ("Charter Comments") at 1-2 (C-band downlink spectrum "is a crucial component of Charter's core video business with 16.14 million residential video customers and 488,000 small and medium business customers across the country relying on this band to receive their daily news, sports, and entertainment"); Comments of Comcast Corporation and NBCUniversal Media, LLC ("Comcast Comments") at 3-4 (Comcast "receives over 80 percent of primary signals of its cable channels via C-Band satellites," and uses C-band to distribute its "Headend-in-the-Sky" service to "approximately 900,000 subscribers across 900 cable systems, including rural cable operators"); Content Company Comments at 2 (C-band spectrum "is the principal pathway for the delivery of programming to each of the thousands of head-ends of multichannel video programming distributors and each of the well over 1,000 broadcast television stations affiliated with national television networks"); Comments of Block Communications, Inc., Gray Television, Inc. and Meredith Corporation (the "Local Broadcaster Comments") at 3 ("C-band spectrum delivers the nation's most-watched programming every year," and without it "many Americans would not be able to watch the Super Bowl, the Oscars, the NCAA Tournament, coverage of Presidential debates, or any other network programming"); Comments of the National Association of Broadcasters ("NAB Comments") at 3 (C-band FSS "is used to deliver television programming to over 1,000 broadcast television stations affiliated with national networks as well as thousands of MVPD head-ends"); Comments of NCTA – The Internet & Television Association ("NCTA Comments") at 1 ("Programming networks provide video content to more than 100 million American households, including 51.9 million cable video customers"); Comments of QVC, Inc. and HSN, Inc. ("QVC/HSN Comments") at 3 (C-band FSS capacity is used to distribute QVC and HSN programming "to over 100 million homes in the United States").

[8] Content Company Comments at 2; NAB Comments at 3.

underserved by broadband internet service or where terrestrial broadcast signals are limited or non-existent," thereby providing "a valuable public service."[9] In short, "[n]o matter how they watch, C-band downlink spectrum in the 3.7-4.2 GHz band is a critical link in the television distribution chain between content creators and American consumers."[10]

Similarly, radio service providers rely on C-band satellite infrastructure for programming distribution. National Public Radio notes that the Public Radio Satellite System ("PRSS") uses C-band spectrum to annually deliver "more than 450,000 hours of news, music, [and] cultural programming to 1,278 public radio stations throughout the United States," reaching "95% of the U.S. population."[11] "Local public radio stations then broadcast this programming to millions of listeners, including many in rural and other underserved areas of the country, each and every day."[12] Cumulus Media owns and operates 440 commercial radio stations in 90 markets, and Westwood One, the largest radio network in America, provides "programming 24 hours per day, seven days per week" to more than 245 million listeners using more than 5,000 C-band receive-only earth stations nationwide.[13] Satellite Digital Audio Radio Service ("SDARS") provider Sirius XM likewise relies on C-band FSS for audio content provided to its more than 33 million U.S. subscribers.[14]

The ubiquitous coverage and distance-insensitive cost structure of C-band FSS enable religious broadcasters to reach viewers and listeners across the country. For example, Eternal

[9] Comments of Luken Communications, LLC ("Luken Comments") at 3.

[10] NCTA Comments at 1.

[11] Comments of National Public Radio, Inc. ("NPR Comments") at 3.

[12] *Id.* at 4.

[13] Cumulus/Westwood One Comments at 2.

[14] *See* SIA Comments at 4 & n.7.

Word Television Network, Inc., "the largest provider of Catholic television, radio, and online content in the United States and throughout the world," has used C-band FSS for 37 years to distribute its programming, which now serves approximately 300 million television homes worldwide.[15] Linkup Communications Corporation, which provides support for broadcasters that are primarily faith-based non-profit entities, emphasizes that "C-band is the only cost effective and reliable transmission for content delivery" that meets the reliability needs of broadcasters seeking to serve their local communities.[16]

C-band FSS "is also critical for onsite newsgathering and live event coverage."[17] PSSI Global uses C-band satellites to support transmission of thousands of events annually, including the annual Academy Awards, Grammy Awards, Prime-Time Emmy Awards, and People's Choice Awards, the Super Bowl and other important NFL games, Major League Baseball's World Series, playoffs, and All Star events, all PGA golf events including the Masters, the Daytona 500 and all NASCAR series events, the NBA Playoffs, NCAA football bowl games and basketball championships, and nearly every major Pay-Per-View event.[18] NCTA explains that nomadic C-band trucks are dispatched to event venues and used to uplink live content to a network operations center, but that the trucks typically also receive in the 3.7-4.2 GHz C-band

[15] Comments of Eternal Word Television Network, Inc. ("EWTN Comments") at 2. *See also* Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, IBFS File No. SES-REG-20180917-02757, Attachment 1 at 1 (The Church of Jesus Christ of Latter-day Saints has approximately 3,476 C-band downlink earth stations, each of which provides access to broadcasts of religious services and other programming to an average of 1,600 church members).

[16] Comments of Linkup Communications Corporation ("Linkup Comments") at 2.

[17] NCTA Comments at 5. *See also* Content Company Comments at 2 (noting that "many of the Content Companies depend upon temporary fixed links in the C-band to transport video from the field back to studios and on to viewers," and without these links, "the live-event audio and video essential to producing breaking news would falter").

[18] Comments of PSSI Global Services, L.L.C. ("PSSI Comments") at 3.

downlink spectrum in order to integrate other content into the feed and monitor the performance of the output signal.[19]

The near-perfect reliability and expansive coverage of the C-band FSS infrastructure is especially critical to supply essential connectivity and information during emergencies. For many communities affected by Hurricane Michael earlier this year, radio stations provided the sole source of emergency and public safety information to residents without electric power or cellphone service.[20] AT&T emphasizes that it relies on C-band FSS to restore "wireless and wireline services in the event of weather-related or other disasters."[21] Distribution of the Emergency Alert System ("EAS") also is heavily dependent on C-band satellites.[22]

In Alaska, C-band satellite connectivity provides access to "global telecommunications and information networks and enables service to schools, libraries, and rural health care providers throughout rural and remote areas of Alaska."[23] "For many remote Alaskan villages, often primarily home to communities of Alaska Natives, C-band satellite communication

[19] NCTA Comments at 5.

[20] *See* Cumulus/Westwood One Comments at 11 ("satellite-delivered programming generally is regarded as the only reliable means for distribution of essential weather data, allowing watches and warnings without interruption to listeners, first responders, and recovery personnel, even if the terrestrial connection is broken"); Linkup Comments at 4 (after Hurricane Michael, most residents in the region had no power for nearly two weeks, but did have battery-operated radios that allowed them to access critical information); NPR Comments at 7 (in Panama City, Florida, "public radio station WKGC was the only local broadcaster to stay operational before, during, and after [Hurricane Michael], supplying needed information to the community from its permanent backup studio inside the Emergency Operations Center").

[21] AT&T Comments at 3.

[22] *See, e.g.*, Comments of Digital Networks, LLC ("Digital Comments") at 2; Comments of Gary E. Timm, filed Oct. 23, 2018 ("Timm Comments") at 2 (many states rely on C-band FSS distribution channels to relay EAS messages); NPR Comments at 6-7.

[23] Comments of Alaska Communications Internet, LLC ("Alaska Communications Comments") at i. *See also* Comments of GCI Communication Corp. ("GCI Comments") at 2-3.

services represent the only available alternative."[24] Alaska Communications stresses that "C-band FSS is particularly important in enabling telemedicine and distance learning services, on which Alaska is uniquely dependent."[25] The "reliable performance of the 3.7-4.2 GHz band for FSS not only improves economic, educational, and healthcare opportunities in these communities but, in a healthcare emergency, literally can mean the difference between life and death."[26]

The aviation community depends on C-band FSS in Alaska and around the world to supply data essential to the safety of air travel. GCI's Alaskan C-band operations are used by the Federal Aviation Administration to assist pilots in determining local weather conditions statewide.[27] In addition, the National Oceanic and Atmospheric Administration's "NOAAPort" signal "provides vital meteorological information to aircraft in flight over and around the United States," a service with "vital, safety-of-life" implications.[28]

Ships at sea and offshore energy platforms rely on C-band satellite services as well. C-band FSS capacity "is used to connect exploration and drilling rigs in the Gulf of Mexico and

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[24] Alaska Communications Comments at 4. *See also* GCI Comments at 2 (C-band FSS "is oftentimes GCI's only option to provide critical and important services to rural and remote areas").

[25] Alaska Communications Comments at 6.

[26] *Id.* at 13; *see also* GCI Comments at 3 (interruption of the critical services provided to Alaskans by C-band satellites "could result in life-threatening situations").

[27] GCI Comments at 2-3.

[28] Comments of Lockheed Martin Corporation ("Lockheed Martin Comments") at 9-10. *See also* Comments of Aviation Spectrum Resources, Inc. ("ASRI Comments") at 2-3 (C-band FSS "is used worldwide for the backhauling of important aviation data from remote sites or as a redundant secondary link for emergencies should local infrastructure fail"); Comments of the Aerospace Industries Association and the General Aviation Manufacturers Association ("AIA/GAMA Comments") at 2 (the "3.7-4.2 GHz band is important to the aviation community due to its high availability and superior qualities during weather issues," supporting backhauling of aviation data and distribution of weather information via the NOAAPort system).

otherwise support energy sector participants using small C-band remote user terminals."[29] In addition, a number of entities rely on C-band FSS to serve cruise liners and yachts, which require reliable and high capacity connectivity services,[30] and to supply the needs of U.S. Navy vessels for wideband satellite communications.[31]

Moreover, given its high reliability, C-band spectrum is used to perform tracking, telemetry, and command ("TT&C") for both C-band satellites and spacecraft whose primary operations are in other bands. TT&C signals control spacecraft positioning and are essential to ensure safe flight and the continued availability of the services provided by these satellites.[32]

The industries supported by C-band satellite networks are cornerstones of the nation's economy, accounting for millions of jobs and contributing more than a trillion dollars to the annual gross domestic product.[33] Yet these figures tell only a fraction of the story, given the importance of C-band FSS to U.S. residents' safety and quality of life.

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[29] Comments of Speedcast Communications, Inc. ("Speedcast Comments") at 2. *See also* Comments of Global Eagle Entertainment Inc. ("Global Eagle Comments") at 1 (Global Eagle uses C-band FSS "to provide an array of services to maritime vessels and offshore energy platforms, including critical communications and ship telemetry"); Comments of ITC Global, Inc. ("ITC Global Comments") at 2 ("ITC Global provides operational and crew communications to offshore rigs and support vessels in the Gulf of Mexico" using C-band spectrum).

[30] *See* Speedcast Comments at 2; Global Eagle Comments at 1.

[31] SIA Comments at 7.

[32] *Id.* at 7; *see also* Comments of Inmarsat Inc. ("Inmarsat Comments") at 4-5; Lockheed Martin Comments at 9. Given the importance of TT&C functionalities, there is strong support in the record for the Commission's proposals to ensure TT&C sites are protected. *See* Notice at ¶ 180; SIA Comments at 33-34; Inmarsat Comments at 3; Lockheed Martin Comments at 9. No party opposes these measures.

[33] *See* SIA Comments at 7-8 & nn.23-26 (citing estimates that the direct and indirect impact of local television and radio broadcasting totals $1.18 trillion per year and providing job and revenue data for cable television and SDARS); *see also* NCTA Comments at 3 (the total U.S. economic impact of the cable industry in 2016 was $421 billion); QVC/HSN Comments at 3 (QVC and HSN generated approximately $8.5 billion in revenue in 2017).

As the SIA Comments emphasize, for example, the local broadcasting industry, which not only entertains the U.S. population but also alerts it to emergency situations, educates it on current events, and provides vital community connections, would not exist without C-band content delivery.[34] Other parties agree.[35] NPR explains that:

> Public radio could not serve almost forty-one million Americans each week without the PRSS and would not exist without the indispensable, highly efficient programming distribution methods currently employed using C-band spectrum. . . . The PRSS reaches stations in geographically diverse areas, from remote villages in northern Alaska and Native American lands in the Southwest, to major market stations such as WOI in Des Moines, Iowa and KUHF in Houston, Texas. Programs distributed over the PRSS span a variety of formats, including news, cultural information, public affairs, drama, documentaries, classical and contemporary music, and jazz . . . . Eighty percent of programming is broadcast live.[36]

In short, the public interest requires the Commission to preserve and protect the C-band FSS infrastructure, which enables U.S. consumers to access the wide range of local, state, national, and international news, sports, music, and other entertainment programming that we take for granted and supports a panoply of services critical to the safety and well-being of our nation's residents.

B. The Satellite Industry Robustly and Efficiently Uses C-band Spectrum

The facts in the record conclusively rebut any suggestion that C-band satellite networks fail to make full and effective use of C-band spectrum. The evidence before the Commission

[34] SIA Comments at 8-9.

[35] *See, e.g.*, Linkup Comments at 4 (noting that "radio depends on C-band to be profitable" and questioning whether absent C-band content delivery there would be local radio stations in many communities to provide critical information next time a disaster such as Hurricane Michael strikes).

[36] NPR Comments at 5-6.

explicitly confirms what SIA and other satellite parties have stressed throughout this proceeding: dozens of satellites employ all 500 megahertz of the C-band downlink on a 24/7 basis to communicate with thousands of earth stations nationwide.

Indeed, as the Notice recognizes, C-band space stations today "use 864 megahertz of spectrum, or 364 megahertz more than the 500 megahertz available in each direction."[37] As a result, "the band is already operating at approximately 170 percent of its allocated capacity thanks to antenna polarization and spectrum reuse."[38] Because of their wide coverage characteristics, C-band satellites provide overlapping footprints that give customers in any corner of the country a choice of space segment providers.

On the ground, C-band transmissions are received at more than 17,000 registered earth station sites,[39] and "thousands of antennas in operation may still remain unregistered."[40] A significant portion of these sites employ multiple antennas pointed at numerous satellites. NCTA explains that:

> NCTA's largest operator members receive, on average, more than 80 percent of their primary signals of cable programming via C-band, using an average of 128 transponders and communicating with an average of 18 satellites. NCTA's mid-size operators are, by some metrics, even more reliant on C-band, in one case receiving 95 percent of the programming delivered to customers via C-band and communicating with more than 20 satellites. And as NCTA has previously noted, cable system operators have

[37] Notice at ¶ 10.

[38] Comcast Comments at 32.

[39] This total is derived from calculations performed by certain SIA members.

[40] ACA Comments at 6. Based on its internal tracking efforts, the ACA estimates that "as many as 250 small cable operators (both ACA and non-ACA members)" likely did not complete the registration process for their earth stations prior to the October 31, 2018 deadline. *Id*. at 6 n.15. *See also* SIA Comments at 10-11 (observing that many C-band earth station operators may be unaware of the need for registration or may lack the resources to complete the registration process).

> deployed thousands of earth station antennas to receive the programming that they distribute to customers.[41]

Indeed, headends for cable systems require access to all or virtually all of the C-band downlink spectrum currently available.[42]

In contrast to this well-documented usage data, parties that assert C-band FSS spectrum is underutilized rely on a combination of obsolete information and wholly unjustified assertions. CTIA expressly recognizes that "applications covering nearly 20,000 3.7-4.2 GHz earth station antennas" were submitted during the 2018 filing window,[43] but nevertheless cites to a thoroughly outdated filing from October of 2016 to claim that large amounts of C-band spectrum "go needlessly unused."[44] Google's submission has similar internal inconsistencies: despite admitting that it has not yet analyzed "the large volume of newly submitted earth station registration data,"[45] Google purports to characterize the geographic distribution of C-band FSS sites and repeats the assertion it made over a year ago that in suburban and rural areas there will be adequate space available for new terrestrial fixed services without creating interference to active FSS earth stations.[46]

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[41] NCTA Comments at 4. *See also* Charter Comments at 3 ("Charter currently has over 700 receive only earth stations in the band, which are used to provide a substantial portion of Charter's video programming to its millions of subscribers.").

[42] *See Ex Parte* Letter of SES Americom, Inc. and Intelsat Corp., GN Docket No. 17-183, filed Feb. 9, 2018, at 2 (discussing the example of "a small cable system with 15,000 customers that currently receives signals from 23 of 24 C-band transponders").

[43] Comments of CTIA ("CTIA Comments") at 11-12.

[44] *Id.* at 13-14 & n.45, quoting the October 11, 2016 Petition for Rulemaking of the Fixed Wireless Communications Coalition, Inc., RM-11778, at 1.

[45] Comments of Google LLC ("Google Comments") at 17.

[46] *Id.* at 3 & n.6.

Other parties simply ignore any facts that do not support their preconceptions and demonstrate a fundamental misunderstanding of FSS operations. The so-called "Public Interest Spectrum Coalition" is a prime example. Its comments allege that "there is little dispute that currently more than 90 percent of the [C-band's] spectral capacity lies fallow."[47] The Broadband Access Coalition ("BAC") argues that a "typical" C-band earth station uses far less than the full 500 megahertz of C-band downlink spectrum, "as little as 23 megahertz, and does not communicate with the full panoply of orbital locations."[48] In each case, the parties focus on the fact that some subset of C-band receive earth stations use only a fraction of the band.

But just as there are unquestionably thousands of C-band earth stations that primarily point at one satellite and receive signals over a limited segment of spectrum – such as those used for distribution of radio programming – there are also thousands of C-band earth stations at the headends of cable systems and other MVPDs that are looking at as many as twenty different satellites and more than 100 transponders, for a total capacity in excess of 3600 megahertz. The fact that a community may be home to earth stations operated by Associated Press or NPR that have relatively modest bandwidth requirements therefore does not imply that the remaining C-band spectrum in that area is "fallow," as a local cable headend almost certainly is using the full range of C-band receive frequencies, some portions many times over.

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[47] Comments of the Public Interest Spectrum Coalition ("PISC Comments") at 14. *See also* Comments of Microsoft Corporation ("Microsoft Comments") at iii (alleging without any evidentiary support that "much of the 500 megahertz of capacity in the 3.7 GHz band lies fallow in many areas across the country"); Comments of the Broadband Connects America coalition ("BCA Comments") at 17 (acknowledging that "there is widespread and important use of the 3.7 GHz band" by FSS networks but claiming without substantiation that most of the band's "500 megahertz of capacity lies fallow in rural and tribal areas across the country").

[48] Comments of the Broadband Access Coalition ("BAC Comments") at iv. *See also* Comments of the Dynamic Spectrum Alliance ("DSA Comments") at 9 (claiming that a majority of C-band earth stations receive content from at most a few transponders).

In fact, contrary to the claims of the BAC and others, the existence of thousands of antennas that routinely access a small portion of the C-band spectrum is strong evidence of the satellite industry's efficient use of spectrum. Unlike terrestrial architectures that require geographic separation to enable spectrum reuse, satellite infrastructure allows multiple users on the ground to receive signals in the same set of frequencies without harmful interference based on the way their antennas are oriented. Thus, the use by a cable headend of the full range of C-band receive frequencies in a given area has no exclusionary effect on other parties' ability to also access the spectrum in that same area. Video content providers, which require sufficient bandwidth to supply ever higher quality programming services, are the "anchor tenants" whose requirements justify the substantial investment needed to deploy C-band space stations, making it economically feasible for satellite operators to also meet the more limited needs of radio networks and others for cost-effective, nationwide content distribution.

Thus, as the SIA Comments note, "the U.S. C-band space and ground infrastructure . . . blankets the country with reliable, high-quality communications capacity, enabling users to access a wealth of video and audio programming and data services from virtually anywhere and wringing significant value from every megahertz of available spectrum."[49]

II. NO EQUIVALENT SUBSTITUTES EXIST FOR C-BAND FSS CONNECTIVITY

The record before the Commission reinforces SIA's showing that services dependent on the unparalleled reliability and reach of C-band FSS cannot be readily transitioned to other satellite spectrum or to fiber, nor can reliance on C-band FSS be substantially reduced by implementation of more aggressive compression methodologies.[50] Indeed, there is a clear

[49] SIA Comments at 12.

[50] *Id.* at 12-16.

dichotomy in the comments. Assertions that C-band FSS is easily replaceable come from terrestrial interests who lack familiarity and experience with content distribution requirements and have no "skin in the game." In contrast, parties whose services and economic survival depend on continued high-performance nationwide delivery of programming and data to their customers overwhelmingly emphasize the need for continued robust access to C-band satellite services. The Commission must look to these experts in determining its spectrum policies.

The Content Companies provide a succinct summary of the matter:

> Put simply, there is no adequate substitute to the C-band for the Nation's video delivery pipeline. Alternative spectrum bands suffer from weather-related reliability issues, and fiber is not widely available enough to replace current [FSS] usage of the C-band.[51]

NAB agrees, observing that "[b]roadcasters, MVPDs and other distributors rely on the C-band as a key component of a near-flawlessly reliable distribution network that is free of service interruptions and outages that plague fiber optic networks and higher-frequency satellite systems."[52] And Linkup stresses that "C-band is the only cost effective and reliable transmission for content delivery that is sufficient for the 99.99% reliability that broadcasters require to serve their communities."[53]

Numerous filers emphasize that C-band's superior resistance to atmospheric attenuation makes switching to higher frequency satellite bands unacceptable for their services. Comcast explains that:

> 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

[51] Content Company Comments at i.

[52] NAB Comments at 3-4.

[53] Linkup Comments at 2.

> often materially impair the reliability of services in other bands, including the Ku-band. C-Band satellites also use wide coverage beams, unlike in the Ka-band. 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.[54]

For television and radio stations that provide critical information during weather emergencies, use of higher frequency bands creates the risk that signal interruption due to rain or snow will occur during natural disasters when local residents are most in need of dependable service.[55]

Other service providers for whom reliability is a core factor similarly rely on C-band FSS in preference to higher satellite bands. PSSI emphasizes that the "possibility of rain at live events makes dependence upon Ku-band transmission unfeasible" for coverage of breaking news, sports, or other live programming.[56] In Alaska, C-band provides "satellite connectivity for

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[54] Comcast Comments at 5-6 (footnotes omitted). *See also* Altice Comments at 2-3 (Ku-band spectrum is more susceptible to rain fade, "which could decrease the reliability of video programming"); Charter Comments at 3-4 ("alternative satellite spectrum, such as the Ku-band, is not as desirable, as this spectrum is much more susceptible to rain fade, potentially resulting in a poor customer experience"); Content Company Comments at 3-4 ("Ku-band is not an acceptable substitute for C-band spectrum, as it lacks the reliability of the C-band and is susceptible to atmospheric rain fades"); C-SPAN Comments at 4 (because of its susceptibility to rain fade, Ku-band spectrum "is not an equivalent alternative transmission path" to C-band); EWTN Comments at 3 (unlike other frequencies, "C-band provides a broadcast quality signal without dropouts, fading, or signal loss throughout the year and in all conditions"); Luken Comments at 3 (Luken previously used Ku-band to distribute some programming, but "reception reliability was a continuous issue"); NAB Comments at 5-6 ("rain attenuation is the dominant impairment to radio wave propagation" in frequencies above 10 GHz, and even "small changes in the level of reliability provided by C-band distribution could lead to service disruptions and outages that would frustrate consumers and cause severe financial harm to broadcasters, MVPDs and programmers").

[55] *See, e.g.*, Linkup Comments at 4 (Linkup has "built dozens of Ku-band networks," but rain fade in that band can cause "loss of signal and loss of content distribution to a community, often when it is most critical").

[56] PSSI Comments at 6 n.4. PSSI also observes that it is "not physically possible to provide the high order modulation multi-path multiplexed solutions to our customers in the higher frequency Ku-band." *Id.*

critical applications, such as health care and distance learning, that require high degrees of uptime and reliability" and cannot "easily be replaced by Ku- or Ka-band alternatives."[57] Similarly, resistance to atmospheric attenuation is critical for distribution of EAS feeds,[58] transmission of weather information and other data for the aviation industry,[59] and provision of connectivity to ships at sea and oil platforms in the Gulf of Mexico.[60]

Some terrestrial parties repeat here their earlier assertions that the vulnerability of higher frequency satellites to attenuation can be adequately overcome,[61] but as Comcast observes, these speculative claims "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."[62] Indeed, SIA devoted several pages of its November 2017 pleading to thoroughly debunking claims that Ku- or Ka-band service is interchangeable with C-band FSS.[63] SIA demonstrated that contrary to CTIA's unsupported claims, the spot beam architecture of high-throughput Ku-

[57] Alaska Communications Comments at 8. *See also* GCI Comments at 10 ("GCI does not view the currently available Ku- and Ka-band options as suitable alternative options" due to factors including lower link availability resulting from more challenging propagation conditions).

[58] Timm Comments at 5 (rain fade experienced in Ku-band spectrum would "jeopardize the reliability needed for EAS feeds").

[59] ASRI Comments at 2 (C-band FSS used by the aviation industry provides "an exceedingly high level of availability compared to Ku and Ka SATCOM systems, especially during moderate to extreme weather conditions"); AIA/GAMA Comments at 2.

[60] Speedcast Comments at 4 (more robust C-band links are "vital to meet the public safety and national interest needs of the energy industry, for example, which operate in areas of the Gulf of Mexico that regularly experience hurricanes and other strong tropical storms"); ITC Global Comments at 5 (although Ku-band and Ka-band satellites can provide supplemental coverage for off-shore energy and commercial maritime applications, "C-band remains essential due to its high reliability and global reach").

[61] *See* CTIA Comments at 18; Verizon Comments at 13-14.

[62] Comcast Comments at 20-21.

[63] Reply Comments of the Satellite Industry Association, GN Docket No. 17-183, filed Nov. 15, 2017 ("SIA 2017 Reply Comments") at 19-23.

and Ka-band satellites is not well suited to nationwide programming distribution.[64] SIA also conclusively rebutted CTIA's suggestion that Adaptive Coding and Modulation ("ACM") could effectively counteract the effects of rain fade on the reliability of C-band content delivery,[65] explaining that the ACM technique, although potentially useful for services such as two-way data carriage over very small aperture terminal ("VSAT") networks, is not workable for the one-way video delivery services that are the predominant users of C-band FSS capacity in the United States.[66] Verizon's suggestion that rain fade effects in Ku-band could be mitigated by using multiple earth station sites to avoid the localized impact of heavy precipitation[67] is also infeasible. Under this approach, earth station operators would not only have to bear the costs of deploying a redundant antenna at a remote site, they would also need a way to backhaul the content to their headend or broadcast station, multiplying the costs still further.

Leaving aside performance issues, the lack of available capacity in higher spectrum bands sufficient to carry the volume of C-band FSS traffic presents an independent obstacle to any proposal to transition C-band services to Ku- or Ka-band satellites. A number of

[64] *Id.* at 21-22 ("spot beam architecture does not economically or operationally lend itself to the distribution of video and audio content nationwide because the process of transmitting each video or audio channel would have to be duplicated for each spot beam, multiplying operational complexity and cost"). *See also* Reply Comments of SES Americom, Inc., GN Docket No. 17-183, filed Nov. 15, 2017 ("SES 2017 Reply Comments") at 13-14 (spot beam satellites "are tailored to achieve certain objectives, including meeting high demands for data services within a small area," but "are not optimized for delivering a package of programming for reception by MVPDs and broadcast affiliates on a 50-state basis").

[65] *See* CTIA Comments at 18.

[66] SIA 2017 Reply Comments at 20-21. The UMTS Forum study cited by CTIA in both its 2017 comments and its most recent pleading, in fact, mentions VSAT services as benefitting from ACM, but does not discuss content delivery. *See id.* Moreover, ACM requires the presence of a return channel, which C-band receive-only earth stations do not have, and involves lowering the quality of the received signal, which would be unacceptable to content suppliers. *Id.* at 21.

[67] Verizon Comments at 13-14.

commenters note the limited availability of Ku- or Ka-band capacity with the coverage characteristics required to meet their service needs.[68]

The inadequate reach and high cost of fiber, meanwhile, make it wholly unacceptable as a stand-in for the blanket nationwide coverage of C-band satellites. As Comcast highlights:

> C-Band satellites today cover 100 percent of the United States on an efficient point-to-multi-point basis. 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.[69]

In many areas that lack a deployed fiber infrastructure, the economics simply will not justify the expense of extending the fiber network. Linkup, for example, notes that many of its radio station customers have transmitter sites that are "miles from the nearest fiber demarcation," sufficiently distant "that the cost of running fiber to the location is worth more than the sales price of the radio station."[70]

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[68] *See, e.g.*, Altice Comments at 2-3 ("it is unlikely that the Ku-Band could support the additional capacity needed to handle the services on the C-Band"); Digital Comments at 2-3 (noting the limited availability of Ku-band satellite capacity suitable for full-time content providers); GCI Comments at 10 (in Alaska "there is not enough capacity or coverage of Ku-band satellites to move all of the C-Band services and there is minimal, if any, Ka-Band coverage"); Luken Comments at 3 (Ku-band space segment capable of providing capacity for all of Luken's channels is limited in availability).

[69] Comcast Comments at 18 (footnote omitted). *See also* Content Company Comments at 3-4 ("the nation's fiber footprint is insufficient to cover C-band's nationwide reach"); C-SPAN Comments at 3 (C-SPAN considered and rejected relying on fiber technology "primarily because fiber service is simply not available everywhere, nor it is likely to be so soon"); Digital Comments at 2-3 ("Digital's stations are mainly located at unmanned tower sites, many of which have limited or no access to fiber"); NAB Comments at 5("Fiber is far from ubiquitous, particularly in rural America"); NCTA Comments at 9 ("C-band spectrum can readily ensure that the same programming reaches both Manhattan and rural Montana in a cost-effective manner," but "fiber often is sparsely deployed, particularly in rural areas").

[70] Linkup Comments at 4. *See also* ACA Comments at 4 ("The costs associated with fiber deployment and leasing would be prohibitive for most of ACA's smallest operators"); Cumulus/Westwood One Comments at 5 ("the coverage, reliability and cost make fiber virtually an impossible substitute for C-band"); QVC/HSN Comments at 4-5 ("fiber simply is not

Given these economic realities, forcing content distribution off of the C-band FSS infrastructure and on to fiber would "leave broadcasters and cable systems in thousands of smaller cities, towns, and rural areas with no affordable means to access the programming they now provide to their respective communities."[71] Terrestrial interests claiming that fiber can feasibly substitute for C-band FSS allege that fiber is "widely available,"[72] but clearly define that term very differently than the satellite industry, as they base that assessment on deployment of fiber in only 273 cities.[73] In contrast, C-band satellites cover every inch of the contiguous United States many times over.

Moreover, fiber has vulnerabilities that undermine its reliability. AT&T observes that "C-band satellite services present fewer points of failure" than fiber networks and support the "video programming delivery system that works today with near 100 percent reliability."[74] The Content Companies similarly emphasize that fiber "is prone to the risk of fiber cuts, particularly

available or is prohibitively costly to deploy in the many rural and remote area markets that QVC/HSN currently serve").

[71] Cumulus/Westwood One Comments at 5-6. Verizon suggests that other C-band FSS users could follow its example – it operates only two "super" headends, with fiber connecting those earth stations to Verizon systems serving a variety of markets. Verizon Comments at 15. But such an approach is impossible for all the operators of small, standalone cable systems and broadcast stations outside the limited reach of the nation's fiber infrastructure.

[72] T-Mobile Comments at 8. *See also* CTIA Comments at 17; Qualcomm Comments at 5-6.

[73] T-Mobile Comments at 8.

[74] AT&T Comments at 11. *See also* NAB Comments at 5 (citing to "frequent reports of fiber outages affecting consumers and businesses as the result of planned or unplanned fiber cuts from infrastructure projects"); NCTA Comments at 10 ("fiber does not provide the 99.999% reliability that NCTA's members have come to rely on from C-band," as "fiber connectivity is subject to disruption from cuts caused by construction, severe weather, and other damage") (footnotes omitted).

during construction projects or in the wake of severe weather events."[75] Westwood One explains that in the wake of the September 11 attacks when terrestrial services including fiber were damaged, the C-band FSS network allowed it to continue to deliver news and other time-sensitive information to residents in the New York City area.[76] In short, claims by terrestrial interests that fiber's performance is superior to that of C-band FSS cannot be squared with the experience of C-band customers.

Nor can compression technology be expected to materially reduce customer requirements for C-band FSS capacity, contrary to suggestions by some commenters.[77] Significant improvements in compression technology have allowed more channels to be carried over a single transponder, but this progress has been matched or exceeded by demand for higher-definition signals,[78] and there is no reason to believe that trend will reverse given the progression toward 4K, and eventually 8K, video offerings.

In short, the C-band FSS infrastructure provides essential services that no other available technology can match in reach and quality.

[75] Content Company Comments at 3-4 (footnote omitted). *See also* C-SPAN Comments at 3 ("fiber technology's inability to match C-Band satellite service's reliability and cost also made it an unattractive option for us")

[76] Cumulus/Westwood One Comments at 5-6.

[77] CTIA Comments at 19; Qualcomm Comments at 6; Verizon Comments at 15.

[78] *See* Comcast Comments at 7 (despite advances in compression, "innovations in programming and transmission technologies are driving continually rising demand for C-Band capacity"); NCTA Comments at 16 ("gains resulting from new compression may also be cancelled out by the simultaneous, widespread adoption of higher resolution video, which requires additional bandwidth").

III. PARTIES AGREE THAT CO-FREQUENCY SHARING BETWEEN FSS AND TERRESTRIAL 5G OPERATIONS IS INFEASIBLE

The record also confirms SIA's assessment that co-frequency sharing of the 3.7-4.2 GHz band between FSS and terrestrial 5G operations "would be a lose-lose proposition."[79] As the Notice recognizes, the significant separation distances required to protect sensitive receive earth stations from interference would mean "mobile service would not be viable for much of the population."[80] And given the vital services provided by ubiquitously-deployed C-band earth stations, any disruption of their operations would have serious and potentially life-threatening implications.

Terrestrial and satellite interests alike highlight the obstacles to co-frequency sharing of C-band spectrum by terrestrial 5G and FSS operations. T-Mobile observes that "[s]ame-area frequency sharing is not technically possible because protecting satellite receivers from harmful interference from terrestrial emissions will require large separation distances that make sharing across the band infeasible."[81] Analyses performed by Ericsson and Nokia produced the same conclusion, with Ericsson determining that "at least 30 kilometers of separation (best case scenario), and potentially as much as 50-70 kilometers of separation (less favorable conditions), would be required for co-channel coexistence between a terrestrial wireless base station and a C-band earth station using the same spectrum."[82] These findings comport with the results of

[79] SIA Comments at ii.

[80] Notice at ¶ 52.

[81] T-Mobile Comments at 8. *See also* Alaska Communications Comments at 12 ("The propagation and interference characteristics of the 3.7-4.2 GHz band mean that it is infeasible for new terrestrial mobile services to operate in close proximity to co-frequency FSS satellite earth station receivers.").

[82] Ericsson Comments at 11 (footnote omitted). *See also* Nokia Comments, Technical Appendix at 15 (Nokia's study concludes that co-channel deployment of 5G and C-band earth stations could incur significant interference to the earth stations when in close proximity to each other).

international studies regarding the "requirement for significant separation zones to protect FSS earth stations from new wireless broadband services."[83]

The record clearly demonstrates the dangers to the public interest if C-band FSS reception is compromised due to interference from new terrestrial deploments. As Cumulus and Westwood One point out, the possibility of interference to C-band FSS service continuity "is unacceptable, not only from the standpoint of potential lost revenue, but because . . . interference jeopardizes the ability of millions of Americans to continue to receive the programming content they have come to rely upon."[84] Service outages due to interference represent "a serious threat to public safety," particularly for residents of "rural areas who rely upon the C-band for essential safety-of-life communications, including air traffic control, distribution of emergency alerts, National Weather Service, first responders, and other emergency services."[85]

Commenters also stress the difficulty of addressing interference effects after the fact, given the time and expense associated with pinpointing the source of interference and developing and implementing a resolution to the problem.[86] Instead, parties emphasize that the Commission must be diligent in preventing interference from occurring by subjecting proposals for new

[83] Comments of the North American Broadcasters Association ("NABA Comments") at 1. *See also* SIA Comments at 17 & n.56, *citing* 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 (06/2015), available at: https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-S.2368-2015-PDF-E.pdf at 31.

[84] Cumulus/Westwood One Comments at 14.

[85] *Id*.

[86] *See, e.g.*, Digital Comments at 3 ("Digital has been affected at certain sites by terrestrial based microwave and WISP-type equipment installations located in close proximity to our receive earth stations," and the effort to resolve such issues has been costly and time-consuming).

terrestrial services in C-band FSS spectrum to rigorous technical review.[87] Only by doing so can the Commission ensure that satellite services that benefit every U.S. resident are protected and preserved.

IV. THE RECORD SHOWS THAT BURDENING INCUMBENT FSS OPERATIONS TO BENEFIT INCOMPATIBLE NEW P2MP SYSTEMS IS UNJUSTIFIED

As the SIA Comments make clear,[88] proposals in the Notice to terminate full-band, full-arc protection for C-band earth stations,[89] impose onerous information and application requirements on earth station operators,[90] and codify the freeze on new earth station applications[91] would hamstring the flexibility that is critical to the efficiency and competitiveness of the FSS market, directly contravening the Commission's interest in minimizing the impact of its policy modifications on "current C-band business models and operations."[92] The only rationale for these burdensome changes is to lay the groundwork for introduction of P2MP systems into intensively-used C-band downlink spectrum, but P2MP proponents have failed to show a concrete need for additional spectrum or demonstrate that they can co-exist with tens of thousands of deployed and operational C-band receive antennas. In short, this set of proposals abjectly fails the most basic cost-benefit analysis.

[87] *See* SIA Comments at 18-20; Comcast Comments at ii.

[88] SIA Comments at 20-33.

[89] Notice at ¶¶ 37-40.

[90] *Id*. at ¶¶ 41-45.

[91] *Id*. at ¶ 30.

[92] *Id*. at ¶ 40.

A. Assertions by P2MP Interests That They Need and Could Meaningfully Use C-band FSS Spectrum Are Unproven

The record is devoid of any persuasive showing that introducing P2MP services in C-band FSS spectrum would serve the public interest. The BAC and its supporters have not established that they require any additional spectrum or that they would be able to operate without disrupting essential C-band FSS operations.

1. Ample Spectrum Is Available for Terrestrial Fixed Broadband

As a threshold matter, there is absolutely no evidence to suggest that terrestrial fixed broadband access providers require more spectrum in order to expand their services. The BAC and its adherents tout the success of wireless internet service providers ("WISPs") in bringing terrestrial broadband connectivity to communities in which deployment of wired technologies may not be economical[93] and recite statistics regarding the percentage of Americans who continue to lack access to terrestrial fixed broadband systems.[94] But the conclusion BAC supporters draw from this combination of facts – that access to more spectrum for terrestrial fixed P2MP services is needed to help bridge the digital divide[95] – is completely illogical. Clearly, WISPs have enjoyed success to date in supplying broadband service in less densely populated areas without the use of C-band FSS frequencies; there is no apparent reason they can't use the same strategies and spectrum to satisfy any remaining unmet need for terrestrial fixed wireless access.

[93] BAC Comments at 11-13; BCA Comments at 18-19.

[94] BAC Comments at 8; BCA Comments at 5-7. As GCI points out, these statistics ignore the fact that satellite-delivered broadband service is available nationwide at competitive rates. GCI Comments at 24.

[95] BAC Comments at 13; BCA Comments at 16.

Indeed, as the SIA Comments discuss, WISPs currently use a mixture of licensed and unlicensed spectrum that accounts for more than 10 GHz of total bandwidth and includes a substantial amount of mid-band spectrum.[96] Thus, any WISP who is interested in building out facilities to new communities that lack other terrestrial broadband alternatives has access to ample spectrum resources – by definition, spectrum scarcity cannot be a concern in areas that currently are unserved by WISP networks.[97]

Moreover, additional spectrum will be available for WISP operations in the future. As SIA and other commenters observe, implementation of the Commission's Citizens Broadband Radio Service ("CBRS") will give WISPs options to make broader use of the 3.55-3.7 GHz frequencies, including participating in the bidding for Priority Access Licenses and using spectrum opportunistically as permitted under the General Authorized Access category.[98] Pending proceedings relating to the 2.5 GHz, 4.9 GHz, and 6 GHz frequencies could lay the groundwork for WISP operations in those bands as well.[99] WISPs would also be eligible to seek flexible use authority if the Commission adopts a market-based mechanism to make a portion of the 3.7-4.2 GHz band available for new terrestrial operations.[100]

Given the substantial amount of spectrum that is or soon will be available for terrestrial fixed broadband services, there is no possible justification to attempt to introduce P2MP services

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[96] SIA Comments at 24-25 & n.79 (citing a Carmel Group report available at the Wireless Internet Service Providers Association's website).

[97] SIA Comments at 25; TIA Comments at 8 ("it is not clear that point-to-multipoint services in rural areas would be capacity-constrained to a level that justifies additional spectrum").

[98] SIA Comments at 25-26; CTIA Comments at 26; GCI Comments at 24; Nokia Comments at 10; TIA Comments at 8.

[99] SIA Comments at 25-26; CTIA Comments at 26; Nokia Comments at 10; TIA Comments at 8.

[100] SIA Comments at 26; AT&T Comments at 14; CTIA Comments at 26; Nokia Comments at 9; TIA Comments at 9; T-Mobile Comments at 21.

in spectrum intensively used for C-band FSS downlinks. Instead, the same rationale that led the Commission to propose a sunset of fixed point-to-point operations in the 3.7-4.2 GHz band – the "availability of other spectrum options" for such services[101] – dictates that the Commission should decline to authorize new P2MP services in these frequencies given the substantial alternatives available for P2MP operations.[102] Instead, the Commission should focus on other spectrum to meet any legitimate need for additional spectrum that can be used for terrestrial fixed broadband operations.[103]

2. The Requirements to Protect Ubiquitous C-band FSS Operations Would Preclude Significant P2MP Deployment

One significant advantage of the bands discussed above is that they provide a much less encumbered spectrum landscape than the 3.7-4.2 GHz spectrum. The BAC explicitly recognizes that P2MP systems could be deployed only if they can "protect incumbent FSS earth stations from interference."[104] But as NCTA stresses, "[p]roponents of introducing fixed P2MP operations have not provided adequate technical analysis to demonstrate that such new

[101] Notice at ¶ 48.

[102] SIA Comments at 25; Nokia Comments at 10.

[103] SIA Comments at 26; C-SPAN Comments at 4 ("C·SPAN urges the Commission to focus on other spectrum that is not as intensely used as the C-Band to meet requirements for additional frequencies suitable for P2MP operations"); CTIA Comments at 26 ("Other bands are more appropriate for P2MP stakeholders that wish to enter the market – particularly with small rural offerings"); GCI Comments at 24 ("the FCC should take a closer look at the FS community's proclaimed need for access to the C-Band, and other available options before acting on the BAC Proposal"); Nokia Comments at 10 (the Commission should "look to other spectrum bands to accommodate point-to-multipoint service, if it determines such a special allocation of this type (as opposed to the overwhelming trend toward flexible use allocations) would serve the public interest").

[104] BAC Comments at 22.

operations could be deployed without causing harmful interference to 3.7-4.2 GHz earth stations."[105]

Instead, the BAC and its supporters have always based their rosy predictions regarding the feasibility of C-band P2MP introduction on the flawed belief that a relatively small number of earth stations operate in the 3.7-4.2 GHz band, leaving significant portions of the spectrum unused in many areas, and their comments here reflect the same false assumptions. The BAC and Google cite to presentations they made to Commission staff in March regarding their analysis of the prospects for P2MP sharing of FSS spectrum.[106] As NCTA explains, however, that analysis:

> is premised on an assumption that far fewer earth stations operate across the country than are now registered, leaving ample geographic areas where fixed P2MP services could be deployed. With 3.7-4.2 GHz earth station registrations reaching approximately 16,500 as of October 26, this analysis is out of date and cannot be used as the basis for Commission action.[107]

Suggestions that a database approach similar to that adopted for the CBRS spectrum would enable P2MP systems to be introduced without compromising the quality and reliability of FSS operations[108] must also be dismissed. The Spectrum Access System ("SAS") database framework has not yet been implemented or evaluated for its effectiveness in the CBRS frequencies, and claims that it can be readily applied to the 3.7-4.2 GHz band are wholly

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[105] NCTA Comments at 21.

[106] BAC Comments at 14; Google Comments at 7. The BCA cites to this same March 2018 analysis to support its assertion that "[f]ixed wireless P2MP systems are able to operate in the 3.7-4.2 GHz band without causing interference to co-channel FSS systems in many local areas across the country." BCA Comments at 19-20 (footnote omitted).

[107] NCTA Comments at 21 (footnote omitted).

[108] *See* DSA Comments at 7, 15; Comments of Federated Wireless, Inc. ("Federated Comments") at 5; PISC Comments at 15-18.

unfounded. As the Notice points out, the Commission was able to establish the CBRS "despite the presence of FSS receivers because there are only FSS earth stations in 35 cities and two MSS gateways in the 3600-3700 MHz band," a situation "unlike the current incumbent earth station environment in the 3.7-4.2 GHz band,"[109] which has more than 17,000 registered earth stations. Assertions that a database approach could not only protect this deployed population of C-band ground facilities, but also afford earth stations the "flexibility to switch transponders or frequencies quickly, as necessary"[110] or that the database for the 3.7-4.2 GHz frequencies would not need to be as complex as the SAS to be used in CBRS spectrum[111] are more fanciful still. Nothing in the record or the Commission's experience supports the idea that a database approach could effectively allow entry of P2MP systems while preventing interference to tens of thousands of ubiquitously-deployed C-band receive antennas.

Instead, the facts show that there will be few, if any, opportunities to shoehorn in new P2MP operations without threatening disruption of critical FSS services. The Content Companies point out that P2MP "transmissions necessarily emit high-powered signals in many directions, which greatly increases the difficulty of frequency coordination and the potential for harmful interference to existing C-band usage."[112] GCI agrees that "it will be extremely difficult, if not impossible, to protect incumbent FSS operations in the C-Band from P2MP" systems.[113]

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[109] *See* Notice at ¶ 52 (footnote omitted).

[110] DSA Comments at 7. *See also* PISC Comments at 15-16.

[111] PISC Comments at 18.

[112] Content Company Comments at 11.

[113] GCI Comments at 22. GCI explains that satellite receive signals are highly vulnerable to interference and highlights the difficulty of redressing interference if it occurs. *See id.* at 22-23.

Indeed, the evidence from BAC proponents themselves suggests that the separation distances surrounding receive earth stations needed to prevent P2MP transmissions from causing harmful interference are similar to those discussed above for terrestrial 5G operations – on the order of 50 kilometers.[114] As a result, the same analysis that led the Commission to determine that co-channel sharing between FSS and mobile wireless is infeasible, even if protection were limited to each earth station's specific frequencies and antenna orientation and assuming only a 20-kilometer exclusion zone,[115] requires the Commission to reject the idea that P2MP systems could be deployed to any significant extent while ensuring protection of critical FSS operations.

B. Limiting FSS Flexibility and Imposing Burdensome New Regulatory Requirements Would Undermine the Public Value of Satellite Networks

Because the failure of the BAC and its supporters to make a valid case for P2MP access to C-band FSS spectrum requires the Commission to reject their proposals, there is no justification for adopting measures to handcuff FSS network operations or subject space and earth station operators to onerous new filing obligations. Instead, the Commission should preserve long-standing policies that promote efficient FSS spectrum use, support robust competition in the market for satellite services, enable expansion of essential services to new communities, and minimize unnecessary regulatory burdens.

1. Full-Band, Full-Arc Protection of Earth Stations Must Be Maintained

The comments provide ample evidence of the myriad benefits to C-band FSS customers of full-band, full-arc earth station licensing. At the same time, suggestions that full-band, full-arc protection is inefficient or unnecessary reflect a fundamental misunderstanding of the FSS operating environment.

[114] *See* SIA Comments at 32 & n.99.

[115] *See* Notice at ¶ 52 & Figure 2.

Service continuity: Satellite service users stress that the ability to quickly change antenna orientations and spectrum channels without the need for regulatory approval is essential to ensure service continuity in the event of an outage affecting the user's primary space segment, to accommodate a transition to replacement capacity, or to mitigate the effects of periodic sun transit events.[116] A number of these commenters speak from first-hand experience. Luken, for example, reports that:

> Luken's programming transmission abruptly ceased as a result of the unforeseen failure of the AMC-9 satellite. This failure required all Luken related earth stations to re-orient to alternate positions and frequencies. The transition to the new satellite coordinates by Luken was able to be performed in less than 12 hours, however, in some cases it took more than a week for some of Luken's three hundred affiliates to make the necessary changes. Had [prior] coordination been required, it is likely that Luken and its affiliates would have sustained substantial losses of revenue and viewership.[117]

GCI states that it has purchased "in-orbit protection," allowing the company to access additional capacity at other orbital locations on a priority basis in the event its primary spacecraft experiences a catastrophic failure.[118] In addition, GCI relies on the ability to use additional space segment on less than four hours' notice if needed to restore service provided by terrestrial networks in rural Alaska.[119] Elimination of full-band, full-arc flexibility would "make it

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[116] *See, e.g.*, Comcast Comments at 34; Content Company Comments at 9; C-SPAN Comments at 4; Cumulus/Westwood One Comments at 12-13; Extreme Reach Comments at 5; NAB Comments at 13; NABA Comments at 4; NCTA Comments at 25; NPR Comments at 8, 14; QVC/HSN Comments at 9.

[117] Luken Comments at 5. *See also* NCTA Comments at 25 (discussing a satellite failure that required an NCTA member to change both frequency and antenna orientation and a 2005 incident when the inability to control a satellite whose transmission payload remained active caused significant disruption and required earth stations to be repointed and to operate on alternate frequencies).

[118] GCI Comments at 13.

[119] *Id.*

extremely difficult, if not impossible, for GCI to minimize service interruptions to its customers."[120]

NAB echoes these concerns, emphasizing that "[f]lexibility in both satellite choice and transponder frequency are absolute necessities to assure reliable operation and are key components of the near-flawless reliability that C-band service provides today."[121] NAB goes on to caution that "[e]ven small reductions in this level of reliability would significantly degrade the value of the band and risk significant service interruptions that viewers and listeners would notice and resent."[122]

Competition: Full-band, full-arc licensing of earth stations is essential to the competitiveness of the FSS ecosystem because it allows customers "to negotiate for satellite service from the largest possible universe of space station licensees."[123] Blocking earth station operators from repointing their earth station antennas quickly and easily would have the effect of locking space segment customers into continuing to use their current provider, precluding customers' ability to obtain more favorable terms and conditions from a competing satellite operator.[124]

Interference resolution and response to customer demand: If a customer is experiencing an interference issue, the satellite operator may need to rearrange the spacecraft's traffic assignments to resolve the problem, and earth station flexibility to change frequencies is essential

[120] *Id.*

[121] NAB Comments at 13.

[122] *Id.*

[123] AT&T Comments at 13. *See also* Extreme Reach Comments at 5; QVC/HSN Comments at 9.

[124] SIA Comments at 23; AT&T Comments at 8; GCI Comments at 13.

in such cases.[125] Similarly, traffic adjustments may be needed to accommodate customer requirements for additional capacity, such as to enable more advanced services like ultra-high definition and 4K video delivery.[126]

Live event coverage: Coverage of breaking news, live sports, and other special events also requires earth station operating flexibility.[127] In such cases, the service provider will procure an expedited coordination to determine what uplink transmission frequencies are available for use in the area during the period required and then find a C-band satellite with capacity available in that bandwidth.[128] Any site that will be receiving the live feed must be able to point its antennas to the selected satellite and use the downlink frequency that corresponds to the uplink channel that has been coordinated. The Content Companies emphasize that live "events regularly utilize more than a dozen satellites across the arc at various frequencies, and the loss of full-band, full-arc coordination could lead to insufficient capacity and diminished reliability of these live transmissions."[129]

Commenters stress that the need for full-band, full-arc earth station flexibility will be even greater if the bandwidth available for FSS downlinks is reduced to accommodate new

[125] *See, e.g.,* SIA Comments at 23; C-SPAN Comments at 4 (full-band, full-arc protection "aids in the resolution of interference issues, which we have also experienced"); Comcast Comments at 34 ("C-Band FSS users rely on the ability to change frequencies, azimuths, and elevation angle parameters without advance notice" if an interference event occurs); Content Company Comments at 9 (full-band, full-arc "flexibility remains essential to nationwide video content delivery when . . . unexpected interference necessitates prompt movement to another satellite and/or frequency").

[126] SIA Comments at 23.

[127] *See* SIA Comments at 23; Comcast Comments at 35; Content Company Comments at 9-10; NABA Comments at 4; NCTA Comments at 25-26.

[128] *See* PSSI Comments at 5.

[129] Content Company Comments at 10.

terrestrial 5G services.[130] Under any framework that limits ongoing FSS access to the 3.7-4.2 GHz band, the remaining C-band spectrum available for FSS must not be encumbered by new spectrum sharing models that would limit the possibility of offering full-band, full-arc services.

Even advocates for the introduction of P2MP services in the 3.7-4.2 GHz band recognize that earth stations require ongoing flexibility to change frequencies and antenna pointing. The PISC Comments expressly acknowledge that "earth stations need to retain the capability to switch to a different transponder, or to a different satellite, to facilitate both service restoration and competition," as well as to implement any transition to FSS use of a more limited portion of the band.[131] The PISC, however, wrongly assumes that earth station flexibility can be accommodated provided that P2MP systems are required to employ frequency agility and to protect FSS incumbents from harmful interference.[132] But if a content provider needs to change transponders or satellites to restore service after a facility outage, it will be logistically impossible, even with frequency agility, for every P2MP provider operating near an earth station receiving that content to adjust quickly enough to ensure that none of the FSS sites receives harmful interference.[133] Simply identifying and notifying all the P2MP providers would take hours, if not days, during which the potential for disruptive interference to FSS service would

[130] *See* SIA Comments at 23-24; Comcast Comments at 36 & n.106; Content Company Comments at 10 (in a repacked C-band, "the Content Companies and other programmers will find it necessary to change satellites and/or frequencies more often in an attempt to mitigate interference to downlinks"); NCTA Comments at 26.

[131] PISC Comments at 15.

[132] *Id.*

[133] Indeed, the BAC suggests that frequency-agile P2MP systems should be allowed *30 days* to alter their operations as needed to accommodate a repacking of FSS operations into a more limited segment of the 3.7-4.2 GHz band. BAC Comments at 29. Television viewers will not want to wait 30 days for their favorite network programming to reappear.

continue. In short, there is no feasible way to allow P2MP services access to FSS spectrum while still preserving the benefits of the current full-band, full-arc policy.[134]

Arguments by terrestrial interests that full-band, full-arc earth station protection results in inefficient spectrum use[135] are based on a fundamental misunderstanding of FSS system architecture and management. The flaw in these arguments is that they purport to evaluate FSS efficiency, not by looking at the overall network consisting of dozens of satellites and tens of thousands of earth station antennas, but by focusing on the spectrum usage by an individual earth station. That approach is equivalent to assessing a mobile telephone network's spectrum efficiency based on the activity of a single device.

From a holistic viewpoint, it is clear that the C-band FSS infrastructure is highly efficient, with space stations blanketing the country with coverage many times over and allowing intensive frequency sharing by an unlimited number of users. As Speedcast explains, the ability of earth stations to communicate with "the full visible portion of the [geostationary] arc at any given location promotes frequency re-use in accord with the Commission's two-degree spacing rules, maximizing the number of C-band satellites available to a customer to obtain service and creating flexibility and enhancing competition."[136] Full-band, full-arc earth station licensing thus plays a central role in the satellite industry's ability to optimize spectrum use and meet

[134] For the same reason, CTIA's statement that it "supports reexamining the full-band, full-arc coordination policy . . . while accommodating protected [FSS] incumbents" (CTIA Comments at 13) is an oxymoron. Only by preserving its existing full-band, full-arc policy can the Commission ensure that customers of incumbent FSS networks continue to benefit from the reliability, quality, and flexibility that characterize FSS services today.

[135] *See, e.g.*, BAC Comments at ii-iii; DSA Comments at 14; Verizon Comments at 11-12.

[136] Speedcast Comments at 8.

customer requirements for continuous, high-quality, competitively-priced nationwide connectivity.

2. New, Administratively-Burdensome Information and Filing Requirements for Earth Station Operators Are Unjustified

In lieu of full-band, full-arc flexibility that requires minimal Commission oversight for receive earth station operations, the Notice proposes to put in place new information, coordination, and application requirements that would subject earth station operators and Commission staff alike to unprecedented and wholly unnecessary administrative burdens. These costly obligations would compromise the reliability of FSS networks, impede restoration of capacity to customers, and stymie competition for satellite services.

Specifically, under the framework set forth in the Notice, operators of all 17,000 earth stations would first have to provide an extremely detailed, antenna-by-antenna snapshot of frequencies and satellites used, azimuth and elevation angles, gain characteristics, and other technical parameters.[137] This snapshot would determine the scope of each antenna's eligibility for protection from future terrestrial services,[138] and any proposal to alter the operating details would require an application to modify the antenna's registration authority, supported by a coordination report, at a total out-of-pocket expenditure of roughly $1,000 per modification.[139]

The combined effect of these costly new requirements would critically undermine the flexibility that is essential to the FSS ecosystem on which customers rely. NCTA emphasizes that:

> operators must be allowed to change frequencies and antenna pointings on short notice without prior approval or burdensome

[137] Notice at ¶ 39, ¶¶ 41-45.

[138] *Id.* at ¶ 39.

[139] SIA Comments at 28.

> notification requirements if television consumers across the country are to continue to receive uninterrupted programming. Neither coordination nor Commission approval should be required prior to changing frequencies or antenna pointings within the portion of the band that remains available for FSS use. Requiring Commission approval before a change, as the Commission appears to contemplate, could mean that television services go off the air for a large number of customers until an antenna or frequency modification is approved. This approach would also significantly increase the burden on Commission staff to process quick-turnaround requests for modification and requests for special temporary authority for modified frequencies and antenna pointings.[140]

In addition to preventing timely restoration of service, these new application requirements would make it effectively impossible for major FSS customers to take advantage of satellite competition. A content provider could switch satellites to obtain better terms for space segment only if all of the earth stations in its network – which could number in the hundreds or thousands – first successfully coordinated and obtained Commission authority for the associated changes.[141] More broadly, imposing additional information and application requirements on FSS operators would divert resources from the provision of critical services to consumers.[142]

The only rationale presented for these burdensome requirements is that they would pave the way for P2MP use of the 3.7-4.2 GHz band,[143] but as discussed above, the record demonstrates neither the need for additional P2MP spectrum nor the ability of P2MP systems to deploy in meaningful numbers without harming incumbent FSS systems. Thus, the Commission

[140] NCTA Comments at 27 (footnote omitted). *See also* SIA Comments at 27-29.

[141] SIA Comments at 28.

[142] GCI Comments at 24.

[143] *See* BAC Comments at 17; Google Comments at 7; Microsoft Comments at 7.

must weigh the massive regulatory costs[144] and public interest harms of applying these requirements to tens of thousands of FSS antennas against the highly speculative prospect of any marginal expansion of fixed wireless broadband access that could not be provided in other, less-encumbered spectrum. This calculus clearly mandates rejection of the new information and filing requirements proposed in the Notice.

3. The Freeze on New Earth Stations Should Be Terminated

The record also demonstrates that the proposal in the Notice to make the current freeze on registration of C-band receive earth stations permanent is unjustified and contrary to the public interest. Commenters describe a variety of circumstances in which applications to add earth stations or relocate antennas will be required, such as when a user needs to expand service to a new community, outgrows its existing antenna facility, loses its property lease, or has its sight lines to satellites blocked by new construction.[145] The Content Companies point out that:

> By proposing to allow *no* new registrations or licenses (only modifications at *existing* locations), the [Notice] mistakenly assumes that the video distribution pipeline can function well in perpetuity under the same parameters that were in place on April 19, 2018. This is a fallacy. Just as mobile providers could not maintain functioning networks if forbidden to deploy new small and macro cells, the Content Companies and other earth station operators require flexibility to obtain new licenses and registrations as needs evolve. . . . If the freeze on new earth station registration is made permanent, as proposed by the NPRM, with each year it will become more challenging for video programmers to make video programming reliably available to the public.[146]

[144] NCTA calculates that the per operator costs of complying with the information requirements proposed in the Notice would be hundreds of thousands of dollars per operator per year. NCTA Comments at 35.

[145] *See* Local Broadcast Comments at 5-8; NCTA Comments at 33-34.

[146] Content Company Comments at 8-9 (emphasis in original). *See also* NABA Comments at 2.

As with the other restrictions on FSS operations proposed in the Notice, the sole purpose of freezing the C-band FSS infrastructure in place is to favor new terrestrial uses.[147] But even if the Commission divides the 3.7-4.2 GHz band to allow terrestrial 5G entry in a portion of it, there is no justification for impeding FSS operators' ability to make robust use of the spectrum that remains available to the industry. Instead, consistent with its statutory obligation to make communications services available "to all the people of the United States,"[148] the Commission must ensure that cable and broadcast television and radio networks and other services that depend on reliable and ubiquitous C-band FSS capacity can continue to grow, develop, and evolve.

In short, as with attempting to impose co-frequency sharing between terrestrial 5G and FSS operations, the proposals in the Notice to open the C-band downlink frequencies to P2MP services would create a "lose-lose" scenario. There is no demonstrated demand for additional P2MP spectrum that these changes would meet, and the substantial protection distances required to safeguard critical FSS operations would radically curtail the areas in which P2MP facilities could use any part of the 3.7-4.2 GHz band. On the other side of the balance sheet, the restrictions on FSS flexibility intended to lay the groundwork for P2MP systems would nullify FSS customers' rights under contracts for protected service, thwart competition, impede satellite operators' ability to manage traffic in response to customer requirements or to resolve interference issues, subject operators of tens of thousands of FSS antennas to staggering and unprecedented new paperwork burdens, and block extension of service to new communities. In order to make good on its stated intention "to protect incumbent FSS earth stations from harmful

[147] *See* BAC Comments at 18; CTIA Comments at 12; T-Mobile Comments at 17.

[148] 47 U.S.C. § 151.

interference and avoid disruption to existing operations in the band,"[149] the Commission must reject both the requests for new P2MP access to the 3.7-4.2 GHz band and the associated restrictions on FSS operational flexibility.

V. CONCLUSION

For these reasons and those set forth in the SIA Comments, the Commission must protect and preserve the ability of the satellite industry to continue to supply reliable, nationwide, competitively-priced C-band services that benefit all residents of the United States.

Respectfully submitted,

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[149] Notice at ¶ 116.