

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, D.C. 20554

In the Matter of	)	
	)	
Public Notice Seeking Comment for Report on the	)	GN Docket No. 18-122
Feasibility of Allowing Commercial Wireless	)	
Services, Licensed or Unlicensed, to Use or Share	)	
Use of the Frequencies Between 3.7-4.2 GHz	)	

**COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION**

The Satellite Industry Association (“SIA”)<sup>1,2</sup> hereby comments in response to the above-referenced Public Notice, which seeks input for a report to Congress on whether new terrestrial wireless services can feasibly be introduced in the 3.7-4.2 GHz frequencies (“4 GHz band”) used for fixed-satellite service (“FSS”) downlinks.<sup>3</sup> As discussed herein, evidence already before the Commission demonstrates that C-band satellites play a critical role in the nation’s infrastructure, supplying essential commercial and government services, and that co-frequency, co-coverage sharing between FSS and new terrestrial wireless services is not feasible. Given these practical realities, any attempt to insert new licensed or unlicensed terrestrial services into the robustly-

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<sup>1</sup> 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.; Analytical Graphics, Inc.; Artel, LLC; Blue Origin; DataPath, Inc.; Eutelsat America Corp.; Globecom, Inc.; Glowlink Communications Technology, Inc.; HawkEye 360; Hughes Defense and Intelligence Systems/Government Solutions; Inmarsat, Inc.; Kymeta Corporation; L3 Technologies; Panasonic Avionics Corporation; Planet; SES; Telesat; TrustComm, Inc.; Ultisat, Inc.; and XTAR, LLC. For more information on SIA, see [www.sia.org](http://www.sia.org).

<sup>2</sup> These comments are supported by all SIA members except for AT&T Services, Inc., which abstains from participation.

<sup>3</sup> *Office of Engineering and Technology, International, and Wireless Telecommunications Bureaus Seek Comment for Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz*, Public Notice, GN Docket No. 18-122 (rel. May 1, 2018) (the “Notice”).

used 4 GHz band would threaten the continuity of vital FSS offerings while imposing significant constraints on where and how terrestrial networks could operate, producing a lose-lose outcome.

**I. THE COMMISSION’S REPORT TO CONGRESS MUST EMPHASIZE THE INDISPENSABLE ROLE OF 4 GHz FSS AS THE BACKBONE FOR CRITICAL COMMERCIAL AND GOVERNMENT NETWORKS**

In their pleadings in response to the Commission’s Notice of Inquiry in GN Docket No. 17-183 (“NOI”), SIA and others have detailed the irreplaceable part that C-band satellites play in a broad range of services used by virtually every U.S. resident on a daily basis: delivering video and audio content nationwide, restoring connectivity when terrestrial links are damaged, supplying lifeline communications to remote locations, distributing emergency alerts, and supporting air traffic control, missile defense, and other public safety and national security systems.<sup>4</sup> These services are possible because satellite operators have invested billions of dollars in space stations capable of serving all fifty states with extremely high reliability, and signals

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<sup>4</sup> Comments of the Satellite Industry Association, (“SIA Comments”) at 5-16; Reply Comments of the Satellite Industry Association, (“SIA Reply”) at 5-9. *See also* Comments of the American Cable Association (“ACA Comments”) at 2-3; Comments of AT&T Services, Inc. (“AT&T Comments”) at 5, 8-9; Comments of the Content Companies (the Walt Disney Company, CBS Corporation, Scripps Networks Interactive, Inc., Time Warner Inc., 21st Century Fox, Inc., and Viacom Inc.) (“Content Company Comments”) at 1; Comments of Eternal Word Television Network, Inc. at 4 & n.5; Comments of General Communication, Inc. (“GCI Comments”) at 2-3, 5; Comments of iHeartMedia + Entertainment, Inc. at 1-2; Comments of the National Association of Broadcasters (“NAB Comments”) at 2; Comments of NCTA – The Internet & Television Association at 3; Comments of National Public Radio, Inc. (“NPR Comments”) at 4, 9; Comments of SES Americom, Inc. (“SES Comments”) at 2-3; Reply Comments of SES Americom, Inc. (“SES Reply”) at 2-6; Comments of Sirius XM Radio Inc. at 5-6, 8; Reply Comments of Aviation Spectrum Resources Inc., Oct. 3, 2017, at 2. Unless otherwise specified, all comments and reply comments cited herein were submitted in GN Docket No. 17-183 on October 2, 2017, and November 15, 2017, respectively.

from these satellites are received by ubiquitously-deployed earth stations that represent millions of dollars in additional capital expenditure.<sup>5</sup>

Moreover, satellite service is distance-insensitive, enabling the customer of a small cable system in Ketchikan, Alaska to receive the same programming variety and advanced functionality, including ultra-high definition service, enjoyed by a viewer in New York, Chicago, or Los Angeles.<sup>6</sup> Disruption of this network would impair the delivery of entertainment, sports, news, and weather programming, threaten connectivity in underserved areas, and compromise the resiliency of the national communications infrastructure.

Attempts by some parties to downplay the significance of C-band FSS operations, suggesting that the spectrum is underutilized, are based on the blatantly false premise that the Commission's IBFS database accurately depicts receive earth station deployment. In fact, the comments in response to the NOI show that the overwhelming majority of earth stations – up to 90% – are unregistered, a rate that suggests the total number of 4 GHz earth stations in use is in the tens of thousands.<sup>7</sup> These widely-dispersed receive antennas make possible the highly efficient distribution of video and audio programming and other services nationwide.

The record makes clear that core C-band functionalities cannot practicably be matched or replaced by other technologies. The alternatives to C-band satellite service that have been suggested cannot provide the high reliability of C-band FSS networks. Attempting to replace the

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<sup>5</sup> SIA Comments at 17-19; SES Reply at 6-10; Letter from Brian M. Josef, Comcast Corp., GN Dkt Nos. 17-258 & 18-122, May 16, 2018 (“Comcast *Ex Parte*”), Attachment at 2-4.

<sup>6</sup> SIA Comments at 14-16.

<sup>7</sup> ACA Comments at 4 n.6; SIA Reply at 14-16; SES Reply at 8-10. *See also Ex Parte* Presentation of LinkUp Communications Corp., the Society of Broadcast Engineers, Intelsat Corp., and SES Americom, Inc., May 24, 2018 (“LinkUp/SBE *Ex Parte*”) at 1 (extrapolation from the number of C-band earth stations in a typical county suggests that there 25,000-30,000 C-band downlink locations nationwide).

C-band satellite communications backbone would also be extremely costly and would strand billions of dollars in space and ground station infrastructure.<sup>8</sup>

Satellites on orbit today that use higher FSS frequency bands currently have very limited unoccupied bandwidth, insufficient to take over the considerable traffic now being carried on C-band spacecraft.<sup>9</sup> Moreover, C-band spectrum has greater resistance to atmospheric attenuation and is therefore uniquely able to provide the near-100% reliability levels required by content providers.<sup>10</sup> High performance in adverse weather is also essential for safety-of-life communications like air traffic control, distribution of emergency alerts, and operations of the National Weather Service network, as the conditions that create the greatest degree of attenuation are those in which maintaining connectivity is most critical. Because of the superior availability of C-band FSS, the record indicates that a substantial number of users have shifted from Ku-band to C-band satellite service in recent years.<sup>11</sup>

Fiber also can have reliability issues – AT&T notes that because of cable cuts, referred to as “backhoe fade,” it has found that C-band availability “often exceeds that of fiber.”<sup>12</sup> More importantly, the reach of fiber is limited to a few hundred of the largest metropolitan areas and cannot possibly substitute for the nationwide ubiquity of the C-band satellite infrastructure.<sup>13</sup> Accordingly, attempting to force the use of fiber for video distribution would leave cable systems and broadcasters in thousands of smaller cities, towns, and rural areas with no affordable

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<sup>8</sup> SIA Reply at 22; SES Reply at 16-17.

<sup>9</sup> SIA Reply at 19-23; SES Reply at 13-14.

<sup>10</sup> SIA Reply at 21-21; AT&T Comments at 7-8; SES Reply at 12-13.

<sup>11</sup> LinkUp/SBE *Ex Parte* at 19.

<sup>12</sup> AT&T Comments at 7.

<sup>13</sup> SIA Reply at 23-26; SES Reply at 14-16; Comcast *Ex Parte*, Attachment at 7.

means to access the programming they now provide to their communities. Commenters have highlighted the astronomical costs of extending the fiber infrastructure as well, demonstrating that replicating the reliability of C-band FSS would require expenditures that are either completely beyond the reach of smaller cable systems or would force them to pass on huge price increases to their subscribers.<sup>14</sup> The result would be creation of a stark new divide between urban dwellers who would continue to enjoy a full range of news, sports, and entertainment programming, and residents of less populated areas, whose service would be impaired or terminated.<sup>15</sup> But it is not just video and audio service availability that is at stake – for residents beyond the reach of terrestrial networks, losing C-band satellite connectivity would literally be life-threatening, cutting them off completely from any means of summoning help in an emergency.<sup>16</sup>

Claims that advances in compression technology will lead to reduced demand for 4 GHz capacity are also misplaced. Compression improvements have historically been accompanied by a move to more bandwidth-intensive, higher-quality video formats.<sup>17</sup> Indeed, Comcast and NBCUniversal have emphasized that service innovations, including the emergence of 4K and other high-bandwidth video technologies, “are driving the need for more spectrum, not less.”<sup>18</sup>

SIA supports exploring ways to promote U.S. leadership by making additional spectrum available for next-generation wireless broadband networks, but established, vitally important C-

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<sup>14</sup> SIA Reply at 24-25.

<sup>15</sup> *Id.* at 4, 24-25.

<sup>16</sup> GCI Comments at 2-3.

<sup>17</sup> SIA Reply at 26-27.

<sup>18</sup> Comcast *Ex Parte*, Attachment at 5. *See also* ACA Comments at 15 (the progress towards 4K resolution will drive an increase in the number of C-band transponders and channels needed for video distribution on a national level).

band satellite services that benefit every American must not be sacrificed in that effort. Instead, satellite operators and their customers require ongoing access to C-band frequencies so they can continue to take advantage of the nationwide coverage and outstanding performance possible in this spectrum without the risk of interference from additional terrestrial services.

## **II. CO-FREQUENCY, CO-COVERAGE SHARING BETWEEN FSS AND NEW TERRESTRIAL OPERATIONS IN THE 4 GHz BAND IS NOT FEASIBLE**

The evidence before the Commission also makes clear that attempting to introduce new terrestrial operations on a co-frequency, co-coverage basis with C-band FSS would be contrary to the public interest, as it would compromise valuable FSS services without meeting the stated spectrum needs of terrestrial networks.<sup>19</sup>

The basic problem is one of simple physics. Receive earth station antennas must be designed to capture highly attenuated signals from satellites more than 22,000 miles above the equator. These signals are relatively weak when they reach the ground, particularly in comparison to the typical strength of a terrestrial signal. As a result, satellite downlinks are very vulnerable to interference from terrestrial transmitters.<sup>20</sup>

Analyses by multiple parties have come to the same conclusion: separation distances ranging from tens to hundreds of kilometers would be required to ensure that terrestrial signals do not prevent reliable reception of satellite downlinks.<sup>21</sup> No party disputes this fundamental reality. In fact, the lowest estimate in the NOI comments of the required separation distance between a terrestrial mobile base station and a receive earth station is 30 kilometers, and that

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<sup>19</sup> NAB Comments at 6-8; SIA Reply at 29-30; SES Reply at 18-23.

<sup>20</sup> SIA Comments at 36; Content Company Comments at 6; GCI Comments at 11-13; NPR Comments at 10-11.

<sup>21</sup> SIA Comments at 37-39; SIA Reply at 28-30; SES Reply at 18-20.

calculation reflects unrealistic FSS operating assumptions including very high elevation angles not achievable for many earth stations, and protection criteria inadequate to ensure the high availability that video services require.<sup>22</sup> Using more reasonable assumptions, the same party predicts required separation distances of 50-70 kilometers.<sup>23</sup>

Implementing these distances would require excluding terrestrial mobile operations from the area surrounding each of the potentially tens of thousands of receive earth stations that use 4 GHz spectrum. Protecting earth stations from interference is made exponentially more difficult by the large number of unregistered earth stations about which the Commission lacks sufficient location or operating information. As discussed above, registration rates have historically been quite low, which is not surprising given that under current rules, registration provides virtually no benefits but carries a significant cost. SIA members have been encouraging earth station operators to complete the registration process for their facilities, particularly given the brief 90-day window for submitting such filings specified in the Commission's recent C-band freeze notice.<sup>24</sup> Although hundreds of new registration applications have recently been filed, significant obstacles to registration remain. In particular, as a number of parties have emphasized, the

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<sup>22</sup> Comments of Ericsson at 8 (Ericsson's findings "indicate the need for at least 30 kilometers, under favorable conditions, of separation between a terrestrial wireless base station and a C-band earth station in order for the two services to co-exist on the same spectrum."); Attachment A at 1 (30 kilometer estimate is based on a 40 degree elevation angle and an interference threshold of  $I/N = -3$  dB).

<sup>23</sup> *Id.*, Attachment A at 3 (using an earth station elevation angle of 5 degrees and  $I/N$  values below -6 dB "leads to separation distances as high as 50-70 km"). These estimates do not reflect terrain or clutter effects, but even accounting for those factors yields significant separation distances. *See Ex Parte* Presentation of SES Americom, Inc., GN Dkt No. 17-183, Mar. 2, 2018.

<sup>24</sup> *Temporary Freeze on Applications for New or Modified Fixed Satellite Service Earth Stations and Fixed Microwave Stations in the 3.7-4.2 GHz Band; 90-Day Window to File Applications for Earth Stations Currently Operating in the 3.7-4.2 GHz Band*, Public Notice, GN Dkt Nos. 17-183, 18-122, DA 18-398 (April 19, 2018).

financial and administrative costs of registration are substantial and may pose a deterrent to many earth station operators, particularly those with limited resources and/or large numbers of sites.<sup>25</sup> SIA strongly supports relief from the \$435 per site application fee and adoption of a streamlined process that allows submission of multiple earth station locations as part of a single registration filing. Without such measures, SIA is gravely concerned that at the close of the registration filing window in July, the IBFS database will continue to represent only a fraction of the 4 GHz earth stations that have been deployed and require interference protection.

Applying the separation distances discussed above would severely limit the areas in which new terrestrial mobile services could be provided. As the National Association of Broadcasters emphasized, the exclusion zones needed to prevent interference to sensitive C-band receive earth stations “would significantly impair the value of the spectrum for new users.”<sup>26</sup> SIA member SES has submitted maps showing that using the 30 and 70 kilometer protection distances calculated by Ericsson would preclude mobile services in vast areas of the country.<sup>27</sup>

A failure to apply and enforce separation distances that will adequately protect 4 GHz FSS operations from interference would have profound negative consequences, potentially undermining the continued reliable reception of video and audio programming by U.S. consumers across the country. This prospect is not simply a theoretical concern. Field trials of terrestrial service in Hong Kong resulted in television signals serving *300 million households* throughout Asia being knocked off the air, and during testing of C-band terrestrial service in

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<sup>25</sup> SIA Comments at 23-24; SIA Reply at 30; National Association of Broadcasters *Ex Parte*, GN Dkt Nos. 17-183 & 18-122, May 22, 2018; *Ex Parte* Presentation of the American Cable Association, GN Dkt No. 17-183, Feb. 2, 2018; LinkUp/SBE *Ex Parte* at 2-3.

<sup>26</sup> NAB Comments at 6.

<sup>27</sup> SES Reply at 21-23.



Bolivia, satellite signals carrying television channels in Bolivia were interrupted, causing viewers to miss World Cup games.<sup>28</sup>

The record conclusively shows that allowing fixed point-to-multipoint (“P2MP”) services as proposed by the Broadband Access Coalition (“BAC”) would also be highly disruptive to crucial FSS operations without establishing significant opportunities for new terrestrial networks.<sup>29</sup> As a threshold matter, the BAC and its supporters have consistently ignored the true extent of C-band FSS operations, focusing on the licensed and registered earth stations in IBFS that represent a small fraction of active 4 GHz antennas.<sup>30</sup> Moreover, the BAC has never explained how P2MP operations could possibly adjust quickly enough to accommodate necessary shifts in the frequencies or orientation of receive earth stations. If a satellite customer must modify its network operations to restore service in the event of an outage, for example, no delay can be tolerated. The BAC proposal, however, would require a series of time-consuming steps before the customer could regain access to interference-free capacity. Each of an unknown number of P2MP operators in the vicinity of every earth station that is part of the customer’s network would need to be contacted and would then have to determine and implement a procedure to shift to channels unused by FSS in the area. Such a convoluted process cannot possibly meet video customers’ expectations of near-100% reliability and immediate restoration.

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<sup>28</sup> SIA Comments at 39 & nn.77-78.

<sup>29</sup> *See, e.g.*, Opposition of the Satellite Industry Association, RM-11791, Aug. 7, 2017; Reply of the Satellite Industry Association, RM-11791, Aug. 22, 2017.

<sup>30</sup> *See, e.g.*, *Ex Parte* Presentation of the Broadband Access Coalition and Google LLC, GN Dkt No. 17-183, Mar. 29, 2018, Attachment 2 at 14-21 (discussing potential locations for P2MP operations based only on registered C-band earth stations). Because the BAC’s analysis suggests that separation distances necessary to prevent unacceptable interference to receive earth stations from P2MP facilities could be roughly 50 kilometers, *see id.* at 33, taking into account the thousands or tens of thousands of unregistered earth stations would significantly increase the area within which co-frequency P2MP operations would need to be excluded.

Finally, the same factors that make the 4 GHz band unsuitable for the introduction of new licensed terrestrial operations on a co-frequency basis also preclude the possibility of allowing unlicensed terrestrial deployments in the band. As discussed above, significant protection distances are necessary to prevent stronger terrestrial transmissions from overwhelming the highly attenuated signals received from satellites. With unlicensed devices, the Commission has no control over where the transmitters are placed or how many are deployed and therefore cannot ensure that the thousands of receive earth stations that rely on C-band FSS would be protected from unacceptable interference.

### **III. CONCLUSION**

For the foregoing reasons and those expressed in SIA's comments and reply comments in response to the NOI, the Commission should advise Congress that FSS use of the 4 GHz band must be protected, as it supports a myriad of services that benefit every American, including distribution and contribution of video and audio programming, lifeline connectivity in remote areas, and operations necessary to public safety and national security. The protections required to ensure continuity of these critical services preclude meaningful co-frequency use of the spectrum by new terrestrial services.

Respectfully submitted,

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