Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Utilities Telecom Council and Winchester Cator, LLC	)	RM No. 11429
	)	
	)	
Petition for Rule Making to Establish Rules Governing Critical Infrastructure Industry Fixed Service Operations in the 14.0–14.5 GHz Band	)	

To: The Commission

OPPOSITION OF GLOBAL VSAT FORUM AND EUROPEAN SATELLITE OPERATORS ASSOCIATION

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SUMMARY

The Global VSAT Forum ("GVF") and the European Satellite Operators Association ("ESOA") hereby jointly oppose the Petition for Rule Making ("Petition") submitted by the Utilities Telecom Council and Winchester Cator, LLC (collectively "Petitioners"). The Commission should determine that the Petition to permit shared, secondary terrestrial fixed service ("FS") use of the 14.0-14.5 GHz band is ill-conceived, technically flawed, and glaringly unjustified. The Petition should be denied without further action.

As GVF and ESOA show in this Opposition, Petitioner's proposal would not protect present and future fixed-satellite service ("FSS") operations from harmful interference, and indeed would likely result in harmful interference even at modest deployment levels. The proposed secondary FS would likely cause significant amounts of harmful interference whose source primary FSS licensees in the 14.0-14.5 GHz band would not be able to identify. Petitioners wrongly claim that their proposed FS can avoid causing harmful interference, because their analysis is based on the misapplication of an interference metric and interference mitigation schemes that do not properly take into account all of the current primary and secondary operations in the 14.0-14.5 GHz band. Moreover, Petitioners fail to address protection of future FSS applications in the 14.0-14.5 GHz band as part of their plan seeking the authorization of millions of new FS links.

Petitioners fail to explain why it is necessary to use an FSS band for their proposed critical infrastructure industries and commercial FS service when unused or underused FS bands are available. Currently, there is primary FS spectrum in other frequency bands, including 27 GHz, 38 GHz, and 71 GHz, that is available and/or not close to full capacity. Even C-band spectrum is available for wireless point-to-point applications. Since Petitioners offer no

justification for their selection of the 14.0-14.5 GHz band over other apparent spectrum options, the Commission should not make a new FS allocation when existing frequency bands with available spectrum are already allocated for terrestrial wireless services.

The International Telecommunication Union ("ITU") Radio Regulations and Table of Frequency Allocations will make it impossible for a secondary FS service to be offered in the United States in the 14.0-14.5 GHz band. Presently, there is no FS allocation in the 14.0-14.4 GHz band in ITU Region 2, which encompasses the United States of America, and while revising the U.S. Table of Frequency Allocations is possible, doing so would cause serious problems with non-U.S. satellites operating over the Americas in the 14.0-14.5 GHz band – which satellites are entitled to the full protection of the ITU Radio Regulations from interference from U.S. fixed service stations with no ITU allocation status.

Petitioners' proposal to have their FS stations accept all interference from FSS networks is dubious, because "critical" services are not protected on a secondary basis. Petitioners incorrectly rely on frequency coordination and the use of spread spectrum techniques when these measures are inappropriate to avoid causing harmful interference to current and future users of the 14.0-14.5 GHz band. If the Petitioners' proposal is adopted it is inevitable that they will seek to further disrupt current primary and secondary services' operations by seeking interference protection for their proposed FS systems from the Commission.

The Petitioners would have the Commission cede its responsibility to protect allocated services to a self-interested licensee. The Commission should reject this attempt to subvert the Commission's procedures to ensure that already allocated spectrum users are protected from harmful interference. Also, Petitioners propose without adequate justification a spectrum leasing

arrangement in an effort to gain access to a commercial wireless band that would be assigned without competitive bidding among wireless operators.

The Global VSAT Forum and the European Satellite Operators Association thereby urge the Commission to reject the Petition as fundamentally flawed and insubstantially justified.

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OPPOSITION OF GLOBAL VSAT FORUM AND EUROPEAN SATELLITE OPERATORS ASSOCIATION

I. INTRODUCTION

The Global VSAT Forum ("GVF") and the European Satellite Operators Association ("ESOA") hereby jointly oppose the above-captioned Petition for Rule Making ("Petition") submitted by the Utilities Telecom Council ("UTC") and Winchester Cator, LLC ("Winchester") (collectively "Petitioners").[1] GVF is the international, non-profit association of the VSAT community, and is comprised of nearly 200 members from every region of the world. ESOA represents the interests of the satellite industry with key national, European, and international organizations.[2] The purpose of these organizations is to ensure that satellites benefit from the

[1] The Commission requested comments on the Petition in a recent public notice. See "Consumer & Governmental Affairs Bureau Reference Information Center Petition for Rule Makings Filed", Public Notice, Report No. 2868 (rel. May 27, 2008).

[2] Members of ESOA are EADS Astrium Services, EURASIASAT, EUTELSAT, HELLASSAT, HISPASAT, INMARSAT, SES New Skies, SES SIRIUS, SES S.A., Telenor Broadcasting Holding, and TELESPAZIO. In addition, Arianespace, EADS Astrium Satellites, International Space Brokers, and MANSAT are Supporting Members of ESOA.

appropriate political and regulatory environment to fulfill their vital role in the delivery of communications. For the reasons explained below, the Federal Communications Commission ("Commission") should determine that the Petition is ill-conceived, technically flawed, and glaringly unjustified. The Petition should be denied without further action.

Petitioners have proposed that the Commission commence a rulemaking proceeding to amend Parts 2 and 101 of the Commission's Rule to permit shared, secondary terrestrial fixed service use of the 14.0-14.5 GHz band for so-called critical infrastructure industry ("CII") communications.[3] Specifically, Petitioners urge the Commission to establish the following:

- Fixed point-to-point and point-to-multipoint services for fixed and temporary fixed stations in the 14.0-14.5 GHz band on a secondary basis;
- A single nationwide CII licensee to coordinate and manage all new fixed services ("FS") in the 14.0-14.5 GHz band. The single licensee would be responsible for ensuring that the proposed FS services do not interfere with incumbent operations in the 14.0-14.5 GHz band. The CII licensee would work with CII entities and facilitate their access to the spectrum;
- The CII licensee would perform all necessary on-going frequency coordination and other interference avoidance measures in consultation with a private entity with expertise in satellite and fixed communications. In return, that entity would be permitted to use the CII spectrum on a preemptible basis for non-CII services, including commercial services.[4]

Very Small Aperture Terminals ("VSAT") networks provide critical broadband services to commercial and government customers throughout the world. The 14.0-14.5 GHz fixed-satellite services ("FSS") uplink band that the Petitioners seek to populate with ostensibly compatible "critical infrastructure" fixed point-to-point and point-to-multipoint systems is ideal for VSAT operations; there is no fixed service allocation in this band in the U.S., and only minimal constraints

[3] *Utilities Telecom Telecom Council and Winchester Cator, LLC Petition for Rulemaking to Establish Rules Governing Critical Infrastructure Industry Fixed Service Operations in the 14.0-14.5 GHz Band,* Petition for Rulemaking, RM - No. 11429, at 1, filed May 6, 2008 (*"Petition").*

[4] *Petition* at 3.

presented by federal non-FSS users in parts of the band. Many VSAT networks operate using central Hub facilities and millions of blanket-licensed small remote terminals ubiquitously-deployed throughout the United States and other countries using the 14.0-14.5 GHz band. The freedom from sharing with terrestrial wireless users has enabled the FSS industry to develop a variety of new and exciting applications in the Ku-band, including non-geostationary orbit ("NGSO") systems, earth stations on vessels ("ESVs"), broadband aeronautical satellite applications for wireless Internet on airplanes in flight, and, most recently, vehicle-mounted earth stations ("VMESs").

II. DISCUSSION

The adoption of Petitioners' proposed secondary, terrestrial FS service would adversely impact the FSS industry and its current and future uses of the 14.0-14.5 GHz band. The proposal does not explain why a new FS allocation is needed when existing FS allocations are unused or underused, nor does it establish a credible policy basis for creating a single national FS licensee that would both usurp the Commission's responsibility to ensure protection of primary services and gain a competitive advantage over other FS licensees that acquired their spectrum access rights through competitive bidding.

A. Petitioners' Proposal for Secondary FS in the 14.0-14.5 GHz Band Would Not Protect Present and Future FSS Operations.

The Petitioners' proposed protection scheme for satellite services that currently have primary and secondary allocations in the 14.0-14.5 GHz band[5] is seriously flawed in several respects.

[5] See U.S. Table of Frequency Allocations showing various Federal allocations and fixed satellite (including earth stations on vessels), mobile-satellite and space research services as non-Federal allocations in the 14.0-14.5 GHz band. 47. C.F.R. § 2.106 and n. NG183.

First of all, the Petitioners' proposal would likely cause significant amounts of harmful interference whose source primary FSS licensees would not be able to identify. The Petitioners themselves recognize sharing the 14.0-14.5 GHz band with VSAT terminals will be "challenging" and pose a "relatively high interference risk."[6] In fact, this is an understatement. Petitioners ignore the overwhelming body of technical work that shows ubiquitous terrestrial services and ubiquitous satellite services cannot coexist in the same spectrum.

VSAT terminals are blanket licensed, meaning that they can be located at any point in the country and that a location that had no VSAT terminal yesterday could very well have one tomorrow. Moreover, there are many temporary-fixed FSS terminals that may operate in any given location for up to six months without notice of any kind before moving on to a new location. These traits are hallmarks of the flexibility that makes the 14.0-14.5 GHz band so useful to FSS network and system operators and their millions of customers. These same traits mean, however, that an FS operator will not know where VSAT and other FSS terminals are or may be, and thus is completely unable to assure their protection. In addition, because the Petitioners' proposal seeks blanket licensing of CII terminals in the 14.0-14.5 GHz band, primary FSS licensees would not easily be able to locate an interfering CII terminal and/or identify who was operating the problematic terminal. These are serious flaws in the Petition.

In the past, FSS licensees' VSAT networks faced a similar problem from radar detectors causing intermittent interference whose source was not easily identifiable. The radar detectors were operated from moving motor vehicles to detect when police speed monitoring radar was being operating in the vicinity. The Commission held that "identifying each individual source of interference from radar detectors is not practical for a satellite operator because these devices are mobile and therefore interfere intermittently. Further these interference sources are not under the

[6] *Petition* at 15.

control of the satellite operator, so in most cases it is not possible for the satellite operator to remedy the interference even if the source could be identified."[7] The problem became so severe that the Commission had to ban certain types of radar detectors that were disrupting VSAT network operations.[8] The Petition sets up a repeat of the radar detector dilemma – only with substantially higher power levels. This is unacceptable.

Petitioners also wrongly claim that they are entitled to assert that their proposal protects the FSS from harmful interference if their operations do not cause an increase of six percent or more in the noise temperature of the FSS receivers.[9] This is incorrect. This 6% $\Delta T/T$ criterion is the level FSS operators look to for the purpose of determining whether further coordination is required between two FSS networks. In other words, it is an interference metric that applies between two users of the primary FSS allocation, both of which have equal spectrum rights. Allocation standards dictate that primary users are entitled to cause a level of interference within a frequency band that secondary or non-interference-basis users are not. So it is with $\Delta T/T$. Secondary users of FSS bands are – in the aggregate with all other sources of potential interference apart from other FSS networks – allocated a collective 1% contribution to the noise an FSS link is designed to tolerate. Thus, as a putative secondary operation, the proposed CII FS

[7] *Review of Part 15 and other Parts of the Commission's Rules,* First Report and Order, 17 FCC Rcd 14063, 14067 (2002).

[8] *Review of Part 15 and other Parts of the Commission's Rules,* First Report and Order, 17 FCC Rcd 14063, 14064-68, 14071-73 (2002)(Radar detectors are Part 15 unlicensed, mobile receivers that signal the presence of radio signals used for determining the speed of motor vehicles. Manufacturers introduced newer models using higher frequency oscillators that placed frequency emissions in the 11.7-12.2 GHz VSAT downlink band to enhance detection of police radar while making it more difficult for police to detect the radar detectors in vehicles. Some radar detectors with higher frequency oscillators had radiated emission levels that were far greater than the satellite receive signals in the VSAT downlink band causing significant amounts of harmful interference. The Commission amended its Rules to ensure the emission levels of radar detectors would no longer interfere with satellite operators.).

[9] *Petition* at attached Report, § 2, n.2. The criterion is referred to as 6% $\Delta T/T$.

stations collectively could produce no more than a fraction of a 1% ΔT/T increase in order to be found compatible with the FSS.[10] By Petitioners' own admission, they fail this test.

Next, Petitioners plan to have their CII stations point at least five degrees away from the geostationary orbit ("GSO") arc to help protect the GSO FSS uplink operations.[11] This pointing feature is flawed in at least two respects:

First, the minimum angle is insufficient. FSS networks today have to take account of interference from FSS satellites located six degrees away. A multiplicity of FS terminals pointing only five degrees away from the GSO arc at the power levels the Petitioners propose would rapidly overwhelm the FSS satellite receivers.[12] The Petitioners provide no basis for the allowances they afford themselves at FSS's expense. Second, there is no question that the off-pointing mechanism Petitioners rely on to protect FSS will directly and materially incapacitate the non-geostationary FSS – which itself protects the FSS by operating only at angles away from the GSO arc or right where Petitioners' FS stations will be pointing.[13] The Petition does not address protection of NGSO systems from interference.

[10] See International Telecommunication Union Radiocommunication Sector ("ITU-R") Recommendation S.1432-1, Apportionment of the allowable error performance degradation to the fixed-satellite service hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz (2006).

[11] *Petition* at 13.

[12] By some estimates, it would only take a handful of such FS transmitters to completely disrupt – i.e., harmfully interfere with – the FSS link. The Technical Attachment to this Opposition confirms these estimates, and shows that one FS station of the type proposed by Petitioners pointing at 5 degrees away from the GSO causes a 0.37% increase in the noise floor (meaning that 3 such FS terminals will cause a 1% increase and 18 terminals will cause the 6% increase that is ascribed to co-primary FSS networks. Even if the proposed FS terminals are pointed 19 degrees away from the GSO arc, it would take only 30 such terminals to cause a 0.37% increase in the noise floor. These are very low numbers and counter the Petitioners' claims and ubiquitous deployment aspirations. *See* Technical Attachment, *infra*.

[13] There was a Ku-band NSGO licensee as recently as 2007, and new applications could be filed any time. Petitioners cannot simultaneously protect and preclude an FSS application.

Moreover, Petitioners have not indicated how the CII licensee would ensure that this pointing requirement is to be respected by both the point-to-point and point-to-multipoint systems or how the CII licensee would ensure that the maximum number of CII terminals is not exceeded. Rather, Petitioners envision that the CII licensee will establish "pre-positioned base station antennas…creating a communications 'cloud' covering populations areas" and "emergency response crews would set up small antennas and point them in the direction of the 'cloud,' thereby establishing a high-capacity link capable of large data and video transmissions."[14]

In a related vein, the Petition includes no showing for protection of secondary mobile-satellite service ("MSS") systems that operate on FSS satellites in the 14.0-14.5 GHz band.[15] Those operations are especially significant, because they are provided for the most part over GSO FSS satellites.[16] Indeed, OmniTracs, a satellite-based land mobile communications and tracking system that provides real-time messaging and position reporting between trucking fleets and their operations centers, processes millions of transactions in the MSS allocation each day.[17]

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[14] *Petition* at 5. It is likely that pointing errors will occur when emergency crews, trained to merely point their secondary transceivers at this "cloud," are rushing to set up these CII communications links. These pointing errors could disrupt primary FSS applications, which may also be providing emergency services simultaneously. As a result, this key part of Petitioners' interference avoidance plan fails, because it would likely result in harmful interference to NGSO systems operating in this frequency band and there are no plans on how to ensure CII terminals comply with the pointing requirement.

[15] Petitioners do acknowledge that the 14.0-14.5 GHz band "includes secondary services such as radionavigation…MSS and space research services." *Petition* at 12. However, Petitioners never address avoiding interference for these secondary services.

[16] OmniTracs is a vehicle-based MSS approach that uses GSO satellites; there are several licensees of aeronautical MSS systems that have invested substantial sums in FSS-based systems and that would be devastated by new FS operations.

[17] *Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service*, Notice of Proposed Rulemaking, 22 FCC Rcd 9649, 9664, ¶ 29 and n.66 (rel. May 15, 2007).

For its failure to discuss how its CII system will avoid causing interference to MSS systems and other secondary services in the 14.0-14.5 GHz band, the Petition is fatally flawed in yet another respect.

Finally, and perhaps most importantly, the Petition makes the tacit, but fatally-flawed assumption that a demonstration of compatibility with the FSS as it stands today is all that is needed to allow the authorization of millions of new FS links in the 14.0-14.5 GHz band. This is dangerously wrong. In fact, the obligation of a secondary operator is to "not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies *may be assigned at a later date*."[18] The FS-free 14.0-14.5 GHz band is particularly hospitable to the generation of new FSS applications. VSATs themselves are a product of this environment – having emerged in fast order from a large-dish environment only 20 or so years ago. Since then, the band has seen the emergence of ESVs, NGSOs, aeronautical-mobile and land-mobile satellite systems that operate over FSS spacecraft, and most recently VMESs. Throughput levels have steadily increased over time. Tens of millions of Americans alone benefit from innovative Ku-band FSS services each day. Introduction of FS into this breeding ground of innovation would freeze the evolution of the FSS in its tracks – assuming for argument's sake that the proposed FS was even compatible with today's FSS (which it is not). The obligation of a putative secondary user to protect future primary applications is not addressed in the Petition – and represents another fatal defect.

[18] 47 C.F.R. 2.105(c)(2)(i) (emphasis added).

C. The ITU Radio Regulations and Table of Frequency Allocations Will Make it Impossible for a Secondary FS to be Offered in the United States in the 14.0-14.5 GHz Band.

The Petitioners' proposal for FS networks in the 14.0-14.5 GHz band is ultimately incompatible with the International Telecommunication Union ("ITU") Radio Regulations ("RRs"). As a result, it would be impossible for the proposed secondary FS service to be offered in the United States in the 14.0-14.5 GHz band. Other countries with FSS operations that would be interfered with by the new FS stations would be within their rights to invoke the procedures in the RRs for addressing and resolving cases of harmful interference.

GVF and ESOA note at the outset that the ITU RRs do not contain any fixed service allocation in the 14.0-14.4 GHz band in ITU Region 2, which encompasses the United States of America.[19] To be sure, the lack of an international allocation does not automatically preclude the Commission from authorizing FS operations that are conducted on a non-harmful interference, non-protected basis with respect to all authorized other services.[20] To the extent that the Petitioners seek to revise the U.S. Table of Frequency Allocations, such a revision would only allow the Commission to dictate interference conditions for U.S.-licensed satellites over which it has control.

[19] Petitioners are aware of the lack of such an allocation in ITU Region 2 and erroneously try to dismiss this regulatory problem by stating that the ITU allocation of 14.3-14.5 GHz in Region 1 and 3 (but importantly, not Region 2 covering the Americas) providing on a co-primary basis to FS, FSS uplink and Mobile services demonstrates that Petitioners' proposed secondary FS allocation for the wider 14.0-14.5 GHz band is technically feasible. *See Petition* at 11, n.17. The mere allocation to the FS in Regions 1 and 3 means no such thing. The allocations date back almost 30 years, and were made without technical study having been undertaken on the compatibility of today's FS and FSS applications. The reality that ubiquitously-deployed satellite terminals cannot share the same spectrum in the same geographic area with ubiquitously-deployed FS terminals was realized later in a well-documented series of ITU-R studies, and applies here. The fact that Petitioners would make such a facile and demonstrably incorrect argument bodes ill for their desired role as guardian of the spectrum henhouse. *See* Section II.E, *infra*.

[20] *See* ITU RR No. 4.4, which permits Administrations to make frequency assignments that are in derogation of the Table of Frequency Allocations, provided that "such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with … these Regulations."

There are a number of satellites that are licensed by other countries that occupy orbital locations over the Americas that could be negatively affected by the Petitioner's proposed FS operations in the United States.[21] Nothing the Commission does can take away the rights of these countries to have their satellites operate free from FS services that are provided in derogation of the RRs. Other ITU-member countries would therefore be within their rights to invoke the procedures in the RRs for addressing and resolving cases of harmful interference that U.S. FS operations in the 14.0-14.5 GHz band cause to non-U.S. satellites. The Petitioners' proposal to operate FS networks in the 14.0-14.5 GHz band in a manner that would not meet the international requirements therefore ultimately must fail.

C. Petitioners Fail to Explain Why It Is Necessary to Use An FSS Band for Their Proposed CII/Commercial FS Service When Unused Or Underused FS Bands Are Available.

Petitioners claim the licensed and unlicensed frequency bands that CII entities currently operate in "are plagued by congestion and interference and are insufficient to meet the growing spectrum needs – especially high-speed data – of CII entities."[22] This one sentence "rationale" is utterly insufficient to support the Petitioners' proposal to use the primary FSS VSAT uplink band for a sole-source, auction-free commercial wireless service when frequency bands allocated on a primary basis to the FS appear to be available.

[21] Again, this point is made in the context of harmful interference being provided to the FSS as it is operated today. Compounding this difficulty is the situation that would result if an FSS satellite were to be launched in five years to provide service to Canada and/or Mexico from a location of the geostationary arc that is visible to the United States, and offer a much more sensitive application than is provided or able to be provided today. The U.S. obligation under the RRs with respect to FS operations provided via No. 4.4 would remain intact, but with ubiquitously-deployed terminals in the field from the new FS operator, there would be no way to unring the bell. An allocation to the FS could very well prevent the U.S. from meeting its obligations under the ITU Convention and RRs.

[22] *Petition* at 8.

Currently, there is primary FS spectrum in other frequency bands, including 27 GHz, 38 GHz, and 71 GHz, that is available and/or not close to full capacity. Even C-band spectrum is available for wireless point-to-point applications. Furthermore, there is no question that FS links in the 14.0-14.5 GHz band would be substantially affected by interference from ubiquitous FSS uplinks (*see* Section II.D, *infra* for further discussion). It should be incumbent upon petitioners who are seeking to add an FS allocation to a U.S. Table of Frequency Allocations that is rife with FS allocations, to show why the existing spectrum is insufficient to meets its requirements.[23] Since Petitioners offer no justification for their selection of the 14.0-14.5 GHz band over other apparent spectrum options, the Commission should not make a new FS allocation when existing frequency bands with available spectrum are already allocated for terrestrial wireless services.

D. Petitioners' Proposal to Have Their CII FS Stations and Links Accept All Interference from FSS Networks is Dubious; "Critical" Services Are Not Protected on a Secondary Basis.

The Petitioners' claim that their FS wireless services will accept all interference from FSS systems is unrealistic due to the emergency nature and technical specification of the proposed CII systems. The Petitioners state that CII applications are "critical" and "require high availability (99.999%)."[24] This type of critical application is unusual for a secondary service that will be forced to accept interference from primary users in the same frequency band,[25] and it strains credulity to believe that protection for such services will not be sought by Petitioners in

[23] The lack of an explanation for why the Petitioners chose to seek a technically and regulatory problematic FS allocation in the 14.0-14.5 GHz band when other frequency bands are already available for their proposed CII service has the appearance of a contrivance by the petitioners to gain auction-free access to a substantial amount of spectrum. Clearly, not wanting to pay for access to a frequency band allocation for its use would not constitute a valid justification.

[24] *Petition* at attached RKF Report, § 2.

[25] It takes less than two minutes of outages a day to preclude an application from meeting a 99.999% availability objective.

the future. Moreover, many Ku-band FSS applications are designed to respond to emergency situations. As a result, emergencies would result in a convergence of primary FSS and secondary, wireless CII terminals in the same area – leading to a situation whereby the secondary CII terminals' functionality could be disrupted by harmful interference from the FSS terminals and thus the CII terminals would not be able to accomplish emergency operations. It is incomprehensible that CII applications will be able to perform their critical functions as outlined in the Petition if they are licensed as a secondary service.

The Petitioners' notional reliance on frequency coordination to protect the proposed secondary CII service from interference from the primary services operating in the 14.0-14.5 GHz band is particularly misplaced.[26] Frequency coordination is not generally used between primary and secondary services, and the large number of FSS VSAT blanket license deployments and the freedom of location for such networks makes frequency coordination completely impracticable. Thus, another key part of the Petitioners' interference protection plan is based on a flawed assumption.

The Petitioners rely on the use of "spread spectrum techniques," such as Orthogonal Frequency Division Modulation ("OFDM"), "to mitigate the effects of narrowband interference from VSAT terminals."[27] However, this reliance too is misplaced, as it does not take into account the fact that many satellite applications provided over Ku-band FSS systems are not narrowband, but use spread spectrum techniques which cannot be easily avoided by frequency

[26] The Petitioners' proposal envisions a "CII Coordinator" and satellite industry expert private entity working with the CII licensee who will be responsible for frequency coordination with other users in the 14.0-14.5 GHz band, among other tasks. *Petition* at 3, 14-15, 17, 19-20.

[27] *Petition* at 16.

isolation measures.[28] Therefore, in seeking to avoid causing interference to VSAT terminals, the Petitioners' reliance on spread spectrum techniques will actually make the proposed FS stations more likely to disrupt other primary FSS applications in the 14.0-14.5 GHz band.

Once the proposed CII systems are deployed, it is inevitable that these inadequately protected wireless systems and stations will return to the Commission to seek protection from interference and/or elevation to a primary basis. As discussed above, it will be impossible for the proposed CII systems to carry out critical functions on a constant basis while accepting interference from primary FSS systems. As a result, it is to be expected that if the Petitioners' proposal is adopted that it will not be long before the Petitioners seek to disrupt current primary and secondary services' operations in the 14.0-14.5 GHz band by seeking interference protection for their proposed FS systems from the Commission.

E. The Petitioners Would Have The Commission Cede Its Responsibility to Protect Allocated Services to A Self-Interested Licensee.

The Petitioners propose that the Commission specify by rule a single, nationwide licensee that would be "responsible for ensuring that the proposed FS services do not interfere with incumbent operations in the band."[29] GVF and ESOA oppose this proposal on multiple levels.

First, a secondary spectrum allocation is to be made only where there is technical assurance that harmful interference to primary users will not occur.[30] Petitioners cannot provide

[28] The land mobile-satellite and aeronautical mobile-satellite services that are provided over Ku-band FSS satellites, as well as some ESVs, employ spread spectrum techniques.
[29] *Petition* at 3.

[30] "[T]he Commission has consistently rejected applications [for secondary and non-interference basis operations] for failing to submit a technical showing that proposed operations would not interference with primary services." *Echostar Satellite, LLC,* Memorandum Opinion and Order, 21 FCC Rcd 4060, 4065 (Int'l Bur. 2006)(denying petition for reconsideration and agreeing with the underlying Order rejecting applications where the applicant failed to provide an adequate interference analysis demonstrating its proposed service would protect users of the superior status users of the same frequency band).

their assurance up front, and seek to defer and refer that obligation to a self-interested licensee. The Commission should reject this idea out of hand. It is the Commission's responsibility to ensure that any putative new user of spectrum on a secondary basis is at least technically capable of satisfying its obligation to protect present and future applications in primary services from harmful interference.[31] If the Commission fails to do this, and places its responsibility in the hands of a third party that either overlooks interference or is too self-interested to make and enforce a shut-down decision, the negative consequences for the FSS operators and their millions of customers would be profound.

Next, Petitioners inappropriately seek to compress what is normally a separate spectrum allocation rulemaking proceeding followed by a separate service rules rulemaking proceeding into a single proceeding where neither element gets satisfactorily addressed.[32] These two, distinct elements serve important but different spectrum management purposes. Even if, for sake of argument, ubiquitous terrestrial wireless use can be made of a ubiquitous satellite band (a condition that has never been found to exist and that Petitioners have not shown here), then a spectrum allocation may be proper. If an allocation with adequate protections for the FSS and other incumbent primary and secondary users, including secondary satellite services, is shown to be viable, only then should the issue of service rules and licensing for that allocation be discussed. Petitioners want to commit the protection element to the discretion of the self-

[31] The Commission shall "have authority to allocate electromagnetic spectrum…if … the Commission finds, after notice and an opportunity for public comment, that … such use would not result in harmful interference among users." 47 U.S.C. § 303(y)(2)(C); "At the heart of the Commission's concerns and obligations is the need to protect the public and spectrum users from harmful interference caused by authorized and unauthorized users." *Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, Report and Order, 18 FCC Rcd 20604, 20648 (2003).

[32] Petitioners ask the Commission to not adopt detailed service rules for its proposed FS allocation, but rather let CII FS users working with the CII licensee use whichever interference mitigation techniques that they think would be best for their specific applications. *Petition* at 16.

interested, sole-source licensee, and then have the Commission leave service rules vague and rely on the licensee's discretion. In GVF's and ESOA's view, Petitioners are conjuring the "perfect storm" for causing harmful interference to the FSS.

To make matters even worse, the spectrum leasing component of the Petition appears to be, first and foremost, an effort to gain access to a commercial wireless band that would be assigned without competitive bidding among wireless operators. Buried within the third objective of the Petitioner's proposal is the notion that the single, nationwide CII licensee would be entitled to enter into spectrum leases to allow commercial wireless uses of the 14.0-14.5 GHz band.[33] Petitioners claim that the nationwide licensee would need to engage a "private entity to manage the relationship with the satellite industry and prevent interference to incumbent primary users of the 14 GHz band."[34] The Petitioners' proposal merely states that as a reward for serving in this frequency management role, the private entity would be "permitted to use the 14.0-14.5 GHz band on a secondary pre-emptible basis for non-CII operations" through a spectrum lease from the CII licensee.[35]

The Petition fails to explain why such a spectrum lease arrangement is necessary to accomplish the goal of meeting the spectrum needs of CII users. No details whatsoever are given as to how the "preemption" of commercial traffic for CII traffic would be achieved and assured. In other contexts, the obligation to design systems that can distinguish between commercial and CII-like transmissions has proven to be a very formidable – indeed insurmountable – obstacle. This has been the case, for example, with a so-far incomplete

[33] *Petition* at 10, 19-20.

[34] *Petition* at 20.

[35] *Petition* at 20.

decade-long effort to prioritize transmissions within the 1.5/1.6 GHz mobile satellite service. Also, the Petitioner's proposal clearly refers to Winchester, a for-profit limited liability company, whose "technical expertise in creating the proposed solution" UTC has relied on, as the prospective non-CII spectrum lease, private entity partner.[36] When all of these factors are considered, it is clear that the Petition is partly a spectrum grab by Winchester to gain a competitive advantage over other commercial wireless providers by gaining access to 500 MHz of spectrum without having to bid for it at auction. This should not be countenanced – and especially not in a band that is of critical importance to millions of satellite service users.

Ultimately, there are too many short cuts and unknowns in the Petitioners' single-licensee proposal. For example, how would the number of CII terminals be limited? Also, what happens if the equipment used under the proposed CII allocation causes greater interference than anticipated? Petitioners' desires to avoid detailed service rules for their operations in the 14.0-14.5 GHz band would leave many of these critical questions unanswered in a regulatory sense, and give too much discretion to a single licensee that does not have protection of the FSS as one of its priorities. In short, both the single licensee and spectrum lease arrangement proposed by Petitioners contain too many potential problems and lack the necessary Commission oversight to ensure that the spectrum is used without causing harmful interference to other users in the 14.0-14.5 GHz band and is operated in the public interest.

[36] The description of the private entity lessee in footnote 30 references footnote 1 which is a description of Winchester. *See Petition* at 1, n.1 and 20-21, n.30.

III. CONCLUSION

On the basis of the foregoing discussion, the Global VSAT Forum and the European Satellite Operators Association urge the Commission to reject the UTC/Winchester Petition as fundamentally flawed and insubstantially justified. The 14.0-14.5 GHz uplink band is vitally important to the satellite industry in the United States of America and beyond, and to the hundreds of millions of people who directly and indirectly rely on VSAT services every day.

The Commission should thus deny the UTC/Winchester Petition and urge the wireless industry to meet any CII and other commercial needs it may have in bands currently allocated for and available to fixed wireless users.

Respectfully submitted,

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Technical Attachment

Introduction

In the proposal for rulemaking submitted by UTC/Winchester, the petitioners propose to add a new secondary allocation in the USA for the FS in the band 14.0 to 14.5 GHz. As the FSS is the only service operating on a primary basis in this band, no specific provision has been made to account for the new interference that would result from the FS. An assessment of the possible impact from the UTC deployment is required and undertaken below.

Details

As the band 14.0 to 14.5 GHz is used in the Earth-to-space direction, the satellite receive beam would suffer interference from all FS terminals located in its coverage area. The following analysis aims at assessing the impact from a single UTC/Winchester terminal into the FSS in order to estimate how many such terminals can be deployed before harmful interference is received by the FSS

In the UTC/Winchester petition for rulemaking, the following maximum operating values are proposed for the FS terminals.

a. 45 cm antenna

b. Avoidance of the GSO arc by 5 degrees

c. The maximum EIRP on boresight in 1 MHz would not be greater than 28 dBW

Step 1 – EIRP from FS towards GSO

The first necessary step is to calculate the off-axis EIRP toward the GSO resulting from a single FS terminal. If the FS antenna is assumed to have an efficiency of 70%, the boresight gain would be of 35 dBi. In this case

$$\mathbf{EIRP(b)} = \mathbf{P}\ (\text{dBW}) + \mathbf{G(b)}\ (\text{dBi})$$

Where:

EIRP(b): The effective isotropic radiated power in the direction of the antenna boresight in dBW.

P: The RF power at the antenna flange in 1 MHz (dBW/MHz)

G(b): Isotropic gain of the antenna in dBi.

By re-arranging the terms:

$$\mathbf{P} = \mathbf{EIRP(b)} - \mathbf{G(b)}$$

$$= 28\ \text{dBW/MHz} - 35\ \text{dBi}$$

= -8 dBW/MHz

To now find the EIRP towards the GSO arc:

$$\mathbf{EIRP(GSO)} = \mathbf{P} + \mathbf{G(GSO)}$$

Where:

EIRP(GSO): The effective isotropic radiated power towards the GSO arc in dBW.
G(GSO): Isotropic gain of the FS antenna towards the GSO
P: -8 dBW/MHz (as calculated above)

$$\mathbf{G(GSO)} = 32 - 25 \log (\text{theta})$$
$$= 32 - 25 \log (5 \text{ degrees})$$
$$= 14.5 \text{ dBi}$$[37]

Thus:

$$\mathbf{EIRP(GSO)} = [-8 \text{ dBW/MHz}] + [\ 14.5 \text{ dBi}]$$
$$= 6.5 \text{ dBW/MHz}$$

Step 2 – Determination of the interference at the GSO

The next step consists of calculating the interference at the receive antenna flange of the GSO satellite. This can be determined using the following equation:

$$\mathbf{I} = \mathbf{EIRP(GSO)} - \mathbf{FSL} + \mathbf{G}$$

Where:

I: Interference at the output flange of the receive antenna (dBW/MHz)
EIRP(GSO): Effective Isotropic Radiated Power towards the satellite (dBW)
FSL: Free Space Loss of the signal through a vacuum from the sub-satellite point to the GSO (dB). (The value is of 206.6 dB at 14.25 GHz.)
G Gain of the satellite receive antenna. Estimated at 35 dBi.[38]

For this case:

$$\mathbf{I} = [6.5] - [206.6] + [35] = -165.1 \text{ dBW/MHz}$$

Step 3 – Determination of the noise level at the GSO

The next step consists of calculating the noise level at the receive antenna of the GSO satellite. This can be found using the equation:

$$\mathbf{N} = 10 \log (\mathbf{k}\ \mathbf{T}\ \mathbf{B})$$

[37] Value derived based on ITU-R Recommendation S465-5.
[38] Typical values of the receive antenna gain and the satellite noise were obtained from the ITU Satellite Network List. For Ku band satellites filed by the USA and having CONUS coverage, value of 35 dBi and 600°K for antenna gain and satellite noise temperature are typical. (See, for example, INTELSAT-8 series.)

Where:

N: Noise power in dBW
k: Boltzman's constant.
T: Noise temperature of the satellite in degrees Kelvin. Estimated at 600°K.
B: Noise bandwidth. In this case, a bandwidth of 1 MHz is used.

$$\mathbf{N} = [-228.6] + [10 \log (600)] + [10 \log (1\ \text{MHz})]$$
$$= -228.6 + 27.8 + 60 = -140.8$$

Step 4 – Determination of the I/N ratio

The final step consists of comparing the interference received with the noise.

$$\mathbf{I/N} = \mathbf{I}\ (\text{dBW/MHz}) - \mathbf{N}\ (\text{dBW/MHz})$$
$$= [-165.1] - [-140.8]$$
$$= -24.3\ \text{dB}$$
$$= 0.37\%\ \text{of the noise floor of the satellite.}$$

To put this value in perspective, coordination between co-primary satellites is triggered at 6% of the noise floor, which would be equivalent to 16 co-frequency FS terminals. Recommendation ITU-R S.1432-1 suggests that FSS systems should take into account the interference impact from all secondary and unallocated users by setting aside 1% of the noise floor. If this value was used by FSS link designers, it allows up to 3 co-frequency FS terminals before the interference allocation has been completely used – and that is if all the impact from the secondary allocations is given only to this service.

Conclusion

A single FS terminal operating at the parameters suggested by UTC/Winchester would cause interference to the GSO by up to 0.37% of the noise floor. While many FS terminals would be pointing further away from the GSO or have lower EIRP, it remains likely that over CONUS, there would be multiple terminals transmitting with parameters at the operational limits. These terminals alone would have the potential of causing harmful interference to the FSS.

Also significant but not considered in this analysis are the FS terminals pointing further away from the GSO arc. However, it needs to be highlighted that even at 5 degrees from the GSO, the FS gain is already down to 14.5 dBi. Thus 30 co-frequency FS terminals operating such that their 0 dBi gain contour points to the GSO would be equivalent to one terminal pointing 5 degrees from the GSO. Given the large number of terminals being proposed for deployment, their aggregate effect would become equivalent to a large number of terminals operating at 5 degrees from the GSO arc.

CERTIFICATE OF SERVICE

I, Rochelle D. Johnson, do hereby certify that on this 26th day of June, 2008, I sent by U.S. first-class, postage prepaid mail, a copy of the foregoing Opposition of Global VSAT Forum and European Satellite Operators Association to the following:

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