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

In the Matter of	)	
	)	
Establishment of Interference Temperature	)	
Metric to Quantify and Manage Interference and	)	ET Docket No. 03-237
To Expand Available Unlicensed Operation in	)	
Certain Fixed, Mobile and Satellite Frequency Bands	)	

REPLY COMMENTS OF

GLOBALSTAR, L.P., ICO GLOBAL COMMUNICATIONS, INMARSAT VENTURES LTD., INTELSAT GLOBAL SERVICE CORP., LOCKHEED MARTIN CORP., LORAL SPACE & COMMUNICATIONS LTD., NEW SKIES SATELLITES, NORTHROP GRUMMAN SPACE TECHNOLOGY, PANAMSAT CORPORATION, AND SES AMERICOM, INC.

May 5, 2004

SUMMARY

Conventional wisdom suggests that when something sounds too good to be true, it probably is. The Commission's proposals for implementation of an interference temperature approach provide a good example. The *Notice* contemplates the creation of a framework that will permit new users to be introduced into licensed spectrum without adversely affecting incumbent providers, thereby leading to an overall gain in spectrum efficiency. But the record here demonstrates that this vision is a mirage.

Specifically, the comments make clear that permitting new unlicensed users to create additional interference to licensed services up to a prescribed limit would impair, not enhance, spectrum efficiency. Licensees would no longer have the incentive or the ability to pursue technological innovations that might increase their service capacity or quality but also make the system more susceptible to harmful interference. As a result, licensees would be locked into outdated technology – with no opportunity to increase their own utilization of the bandwidth in which they are licensed to operate.

Furthermore, the record shows that the *Notice* relies on incorrect assumptions regarding the level of protection needed to ensure that existing services are not impaired. Contrary to the suggestions in the *Notice*, satellite and other licensees do not typically have excess margin that is wasted and that they can afford to give up in order to accommodate new operations. The impact of any new interference must be gauged based on its effect on the most

sensitive links because interference tolerance will vary among satellite systems and even among beams on the same spacecraft.

The comments also confirm the existence of substantial practical obstacles to monitoring and enforcing any interference temperature limits. Each of the monitoring approaches described in the *Notice* is flawed. Even if these issues could be resolved, it is clear that the Commission does not have the necessary tools to identify and redress violations of interference temperature limits.

Given the fundamental questions regarding the viability of the concept, the parties overwhelmingly oppose the Commission's proposal to experiment with an interference temperature framework in licensed spectrum. The plan to use satellite uplink spectrum as a test bed for the approach raises particular problems. The Commission must reconsider whether the interference temperature approach is workable before it can consider applying the approach in any licensed bands.

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Globalstar, L.P., ICO Global Communications, Inmarsat Ventures Ltd., Intelsat Global Service Corp., Lockheed Martin Corp., Loral Space & Communications Ltd., New Skies Satellites, Northrop Grumman Space Technology, PanAmSat Corporation and SES Americom, Inc. (collectively, the "Satellite Companies") hereby submit this reply to the comments of other parties in response to the *Notice of Inquiry and Notice of Proposed Rulemaking* in the above-captioned proceeding, FCC 03-289 (rel. Nov. 28, 2003) (the "*NOI*" and "*NPRM*" or the "*Notice*").

In their initial comments (the "SC Comments"), the Satellite Companies expressed grave concerns with the interference temperature approach to spectrum management outlined in the *Notice*. We pointed out that imposing interference temperature limits could block future innovation by licensees, and that the Commission had not proposed practical and reliable

methods for monitoring or enforcing compliance. We urged the Commission to abandon its proposal to experiment with the interference temperature concept in satellite spectrum until critical issues regarding the concept were resolved.

Other parties – speaking on behalf of service providers, users, and manufacturers from every segment of the communications industry – echo these concerns. Commenters universally question the technical feasibility of the interference temperature approach and overwhelmingly oppose experimentation with this concept in licensed bands. The filings raise a host of practical obstacles to implementation of an interference temperature framework and describe the devastating effects on services if incumbent licensees are not adequately protected from new interference sources.

Based on this record, the Commission must conclude that the interference temperature concept has fundamental flaws and is not ready for implementation in satellite spectrum or any licensed bands.

I. THE RECORD DEMONSTRATES THAT ESTABLISHING AN INTERFERENCE TEMPERATURE WILL THWART INNOVATION AND DIMINISH EFFICIENCY

The Satellite Companies observed that the *Notice* assumes that more efficient use of spectrum can come only through the introduction of new services and users. SC Comments at 5-6. As a result, the *Notice* ignores the strong incentives that incumbent licensees have to maximize spectrum efficiency. These incentives have resulted in significant advances in satellite system design, in turn increasing capacity and making more attractive, higher quality services available to users. *Id.* at 6-8.

The Commission's concept of a fixed interference temperature would threaten the ability of satellite licensees to continue to make such gains in the future and would threaten the viability of existing networks. The same developments that have led to more robust and dynamic offerings have made satellite services more susceptible to interference from other sources. Capping satellite licensees' interference protection would block their ability to introduce new innovations and lock them into obsolete technologies. *Id.* at 8-9.

Other commenters agree that fixing an interference temperature will impair licensees' ability to innovate and improve services, leading to net losses in spectrum efficiency. Cingular/BellSouth observes that:

> [L]icensees' interference tolerance changes over time, and licensees should be given incentives to use their spectrum more efficiently rather than less so. Requiring incumbents to share spectrum with new unlicensed uses, however, has the opposite effect.

Cingular/BellSouth Comments at 14.

As an illustration, several wireless providers point to the significant progress that has been made in cellular and PCS technology over the past ten years – progress that would not have been possible if a fixed interference temperature had been set based on prior technology.[1] Cingular/BellSouth describes the improvements in cellular service over time as licensees have taken advantage of lower noise and interference levels. Cingular/BellSouth

[1] *See, e.g., id.* at 14-16; AT&T Wireless Comments at 22-24; Sprint Comments at 36-38.

Comments at 16. The proposals in the *Notice* could have blocked these advances.

Similarly, if interference temperature limits were set based on today's technology, "there would no longer be an incentive for licensed service operators to develop and deploy advanced technologies that reduce system interference and more efficiently utilize spectrum." V-COMM Comments at 32. Instead, an interference temperature cap "would stifle advances in technology and pose significant limits on future spectrum use for incumbent licensed carriers."[2]

Such outcomes would directly conflict with the Commission's goal of implementing spectrum management policies that will enhance incentives for users to "migrate to more technologically innovative and economically efficient uses of the spectrum." *Notice* at ¶ 6. The record here demonstrates that limiting the flexibility of incumbent licensees will significantly impair future growth in system capacity and service quality. Thus, the Commission must dismiss the notion promoted in the *Notice* that permitting new users pursuant to an interference temperature framework will lead to net benefits for consumers and an overall gain in the efficient use of spectrum.

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[2] *Id.* *See also* New York State Office for Technology Statewide Wireless Network ("NY SWN") Comments at 4 (raising the noise floor "will have an undesired effect on future development of more sensitive receivers"); Agilent Comments at 3 (unless the interference temperature threshold can be adjusted, application of the interference temperature concept "could preclude the primary user from increasing system capacity"); Motorola Comments at 6 (noting the difficulty of developing "an interference temperature that does not impede licensees' ability to innovate and improve their service while maximizing their own spectrum efficiency").

II. LICENSED OPERATIONS MUST BE FULLY PROTECTED

Other parties also support the Satellite Companies with respect to the need to ensure that any interference temperature limits fully protect licensed services. The Satellite Companies strongly objected to the suggestion that "harmful interference," as that term is defined in the Commission's rules, is an appropriate benchmark for setting interference temperature limits. SC Comments at 10-11. We also demonstrated that the assumption in the *Notice* that services with high margins can easily tolerate additional interference was simply wrong. Instead, system margins are set to maintain service quality levels required by customers, and any increase in interference imposes costs and limitations on system operators. *Id.* at 11-13. We noted that Section 301 of the Communications Act limits the Commission's ability to authorize unlicensed devices that interfere with licensed systems. *Id.* at 13. Finally, we emphasized that any interference temperature limits would need to protect the most sensitive links in a given band. *Id.* at 14.

Other parties echo these concerns. The New York Statewide Wireless Network states that any interference temperature "should be set far below what is called 'harmful interference.'" NY SWN Comments at 39. And there is broad criticism of the assumption in the *Notice* that high margin links can withstand additional interference with no penalty. Inmarsat, for example, notes that because of limits on available power, there is a tradeoff between link margin and a satellite system's overall capacity. As a result, "link margin is a very expensive commodity in a satellite system." Inmarsat Comments at 6.

Any interference that decreases a satellite system's link margins will impose costs on the satellite operator and could impair the operator's ability to meet customers' expectations regarding service quality.

Licensees in other services concur. Sprint observes that:

> Fixed link budgets are conservatively developed to provide a high degree of availability given the interference events predicted for the area and service. Introducing a new source of background interference necessarily throws these predictive settings off, amplifying the effects of those events that were anticipated and accounted for in the link budget margins. . . . Any unanticipated increase in the background noise experienced by fixed links, thus, will make these links more susceptible to outages caused by rain or other periodic interfering events.

Sprint Comments at 40.[3] Thus, maintaining the design margins of licensed systems is critical to system efficiency, capacity, coverage, and service quality.

Parties also agree that any new approach to interference management must protect the most sensitive links. The DIRECTV Group, for example, argues that "the Commission must ensure that its reference link budget is protective of the most sensitive receivers currently on file at the ITU" because the impact of interference will affect every beam of every satellite differently. DIRECTV Group Comments at 19. Qualcomm notes that because typical unlicensed transmitters have omnidirectional antennas, "most or all of

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[3] *See also* V-COMM Comments at 29-30 (the margin above the prevailing noise and interference level is used to provide signal quality and extend coverage); Fixed Wireless Communications Coalition ("FWCC") Comments at 12-13 (fixed service systems are designed with sufficient link margin to overcome atmospheric fading and maintain required service quality under worst-case conditions).

the satellite-based [licensed receivers] will receive interference from unlicensed users in that channel." Qualcomm Comments at 18. In order to prevent service disruption, "the licensed satellite with the least margin will have to be used" in setting necessary protection levels. *Id.*

Thus, the record before the Commission demonstrates the critical importance of protecting licensed services. However, no party suggests a reliable method for determining interference temperature limits that can ensure adequate protection of all licensed links.

III. IMPLEMENTATION OF AN INTERFERENCE TEMPERATURE APPROACH IS IMPRACTICAL

The Satellite Companies raised questions regarding the feasibility of the proposals in the *Notice* for monitoring interference temperature and disseminating that information to affected devices. We also noted that effective enforcement of interference temperature limits would be extremely difficult. These concerns are shared by other parties.

A. The Monitoring Approaches Proposed in the *Notice* Are Flawed

The Satellite Companies' comments agreed with the Commission's observation that effective monitoring of interference temperature levels and communication of that information to affected devices would be a critical component of any interference temperature framework. SC Comments at 14-15, *citing Notice* at ¶ 11. However, we noted that there were substantial practical obstacles to achieving this necessary element.

In particular, our comments addressed each of the three proposals for measuring interference temperature and demonstrated that there were fatal problems with each. We explained that Method 1, under which the new devices would themselves monitor the interference environment, was unworkable for satellite spectrum, because ground-based measurements will not reflect the interference being experienced by a satellite receiver thousands of miles away. SC Comments at 15-16. We showed that Method 2, which would require deploying monitoring equipment on satellite receivers, would be prohibitively complicated and expensive to implement in satellite spectrum. *Id.* at 16-17. Method 3, which contemplates a nationwide monitoring system, would also be extremely complex and costly. *Id.* at 17-19.

Our comments also identified a number of specific technical problems with measuring interference temperature levels in satellite spectrum. For example, we noted that baseline interference temperature levels could be measured accurately only if the licensed carriers were turned off. However, this would in turn make real-time measurement of levels impossible. *Id.* at 19. In addition, we observed that there was no way for a monitoring device to distinguish the source of noise and interference and determine the portion of the interference that is attributable to unlicensed devices. *Id.* at 20.

Other commenting parties agree that the Commission's monitoring proposals are problematic. Qualcomm, for example confirms that Method 1 – self-sensing by unlicensed devices – cannot be used effectively in satellite spectrum. Qualcomm explains that an individual device "will not be able to

sense the combined interference" that a satellite receives from all transmitters within its footprint. Qualcomm Comments at 19. Proxim Corporation submits the results of a simulation designed to evaluate whether a device sharing spectrum with a licensed system could accurately measure the interference environment. Proxim states that "we have not been able to discover an efficient method for a sharing device to determine, based on measurements that it, itself, makes, whether or not it can transmit without causing harmful interference." Proxim Comments at 2.

Inmarsat describes in detail the obstacles to having satellites monitor interference temperature levels pursuant to Method 2. For example, Inmarsat notes that the level of measuring accuracy that would be required far exceeds what can be achieved with current technology. Inmarsat Comments at 20. Inmarsat shows that attempting to measure interference at receiving earth station sites also presents problems. In particular, Inmarsat lists the sources of noise and interference received by any individual earth station and notes that it would be impossible to separate out the interference being caused by new unlicensed devices. *Id.* at 21.[4]

The difficulties associated with separating the different sources that contribute to the total interference temperature in bands allocated to satellite uplinks have been extensively discussed and documented recently at

[4] *See also* IEEE 802 Comments at 6 ("requiring licensed services to install expensive and complex infrastructure to universally monitor interference temperature is an unnecessary and counter productive approach to interference prevention").

an ITU meeting,[5]. The specific situation under consideration relates to the 5150-5250 MHz band, where wireless access systems including radio local area networks (RLANs) have been internationally enabled to operate according to decisions taken by the 2003 World Radiocommunication Conference (WRC-03).[6] Operation of RLANs in this band is subject to several conditions, including limits on the aggregate power flux density that can be produced at the interfered satellite. A method to measure the aggregate noise plus interference at the space station was proposed to this Working Party 4A meeting. There was agreement that such measurement would be of little use unless a method could be developed to separate the RLAN contribution from other noise and interference contributions. No specific proposal was available in this respect and challenges associated with this task were raised by several participants in the meeting, as reflected in the meeting output documents.[7]

Qualcomm points out that the terrestrial monitoring network contemplated in Method 3 shares the same flaws as Method 1 when applied to satellite spectrum. Qualcomm states that "it is not possible for a terrestrial monitoring network to accurately determine the interference levels that would

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[5] Meeting of the ITU-R Working Party 4A (Efficient orbit/spectrum utilization) held in Geneva from 14 to 23 April 2004.

[6] *See* Nos. 5.446A & 5.446B of the ITU Radio Regulations and Resolution 229 (WRC-03) ("Use of the bands 5150-5250, 5250-5350 MHz and 5470-5725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks").

[7] Preliminary Draft Revision of Recommendation ITU-R S.1427, Document 4A/TEMP/4(Rev.1), 20 April 2004, to be included in the Chairman's Report of the meeting (not yet available).

be present" at the satellite receiver, due to direction attenuation and the distribution of unlicensed transmitters across the satellite's footprint. Qualcomm Comments at 24. As a result, the Method 3 approach "is just not realizable for FSS bands." *Id*.

Motorola makes a similar point concerning Method 3, noting that:

> [E]ven if a monitoring grid could be established, individual primary receivers may frequently experience higher levels of interference than the monitoring system would predict because they are seldom if ever co-located. In Motorola's view, the establishment of a monitoring network that would broadcast real-time noise floor information would be of limited value if it does not accurately represent the environment of the victim receivers.

Motorola Comments at 14.

Commenters also demonstrate that the nationwide monitoring system envisioned in the *Notice* would be extremely expensive and complex. In its comments, IEEE 802 states that:

> We believe that the cost of creating, not to mention maintaining, a ubiquitous network of monitoring stations would completely overwhelm any short or long term benefit in new economic activity. Further, the complexity of the monitoring process (e.g., time, 3-D space, frequency, polarization, antenna characteristics, etc.) itself appears to us to cast doubt on the reliability of the resulting data and may effectively limit the mass market adoption of such measurement and control solutions.

IEEE 802 Comments at 7-8.[8]

In addition, the parties agree that interference measurement presents fundamental issues under any monitoring approach. Motorola emphasizes that "the only reliable way to measure a true noise floor without considering the contributions of primary services is to command every primary transmitter to be silenced." Motorola Comments at 8. Motorola goes on to point out, however, that the consequences of shutting down all incumbent operations – "the loss of revenue or services to commercial operations or the disruption of other critical private communications" – would be "clearly unacceptable." *Id.* at 9.

Thus, there are significant obstacles to accurate measurement of interference temperature levels. As a result, the implementation of the interference temperature approach contemplated in the *Notice* is simply not workable given current technology.

B. Interference Temperature Limits Cannot Be Effectively Enforced

The Satellite Companies demonstrated that even if the barriers to accurate measurement of interference temperature levels could be overcome, the Commission would also need to devise a means for enforcing applicable limits. Unless a licensed system can get immediate, effective redress in the event the limits are exceeded, the interference temperature approach threatens

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[8] *See also* NY SWN Comments at 17 ("establishment of a ubiquitous monitoring grid to constantly monitor the interference temperature is going to be cost prohibitive and unnecessary.")

to undermine the reliability and quality of licensed services. In this respect, the Commission's proposal to permit new unlicensed devices to share with licensed services is a prescription for chaos, because it would authorize an unknown number of devices, providing services with undefined parameters, at unrestricted locations throughout the country. Under these circumstances, there is no way to ensure that a device that violates the interference limits can be promptly identified and effectively required to terminate transmissions. SC Comments at 20-21.

We noted that our experience with interference to satellite VSAT operations from unlicensed radar detectors illustrated the nature of the enforcement problem. In that case, the Commission quickly determined that radar detectors were disrupting VSAT services, but was only able to address the issue through forward-looking restrictions. The Commission was unable to resolve the continued interference resulting from radar detectors already in the hands of consumers. *Id.* at 21-22. This was a practical decision based on the inability to terminate those existing detectors. The Commission similarly will be unable to terminate interfering devices violating temperature limitations meant to protect licensees.

Numerous other commenters also express concern about the enforcement of interference temperature limits. CTIA, for example, states that policing "unlicensed transmitters would present enormous difficulties in any underlay use of licensed spectrum." CTIA Comments at 13. It goes on to note that once new devices are "unleashed on the marketplace, any FCC

enforcement to mitigate interference or seek technical changes to devices would be extraordinarily difficult." *Id.* at 13-14.

Cingular/BellSouth agrees, observing that:

> [T]he nature of unlicensed spectrum usage makes it virtually impossible to recover from a bad decision. Once millions of unlicensed units are in use, there is no way to stop them from being used for many years to come. Without licenses, the units are beyond any effective means of Commission control.

Cingular/BellSouth Comments at 10 (footnote omitted).

Inmarsat points out that:

> There is no way to ensure the many assumptions the Commission makes about unlicensed devices will hold up in the real world. The Commission has appropriately recognized that it is virtually impossible to control the use of unlicensed devices once they enter the market. Under current rules, manufacturers are not responsible for the use or misuse of the devices by end users. And the Commission has no ability to know how many devices are out there, where they are, or how they are used.

Inmarsat Comments at 18-19 (footnote omitted).[9]

The DIRECTV Group notes that satellite systems will be particularly at risk due to the difficulties relating to enforcement of interference temperature limits. Satellites have a relatively long service life, and once a satellite is launched, the receiver equipment cannot be altered to counteract

[9] *See also* NY SWN Comments at 14 (difficulties with enforcement of interference temperature limits "show that the concept of interference temperature should definitely not be an aspect of future spectrum policy"); AT&T Wireless Comments at 24 (effective enforcement of interference temperature limits would be impossible in practice).

the adverse effects of additional interference. DIRECTV Group Comments at 20.[10]

These enforcement issues undermine the fundamental assumptions underlying the interference temperature approach. The Commission cannot go forward with a framework that authorizes new operations in licensed spectrum without a concrete and effective mechanism for ensuring compliance in order to protect existing licensed services.

IV. THE *NPRM* IS UNJUSTIFIED AND PREMATURE

In light of the critical unanswered questions regarding the feasibility of the interference temperature approach, the Satellite Companies strongly opposed any experimentation with the approach. SC Comments at 25-26. In particular, we explained that the Commission's suggestion that new entrants should be permitted to impose interference on existing FSS systems up to a level of 5% $\Delta T/T$ was completely unacceptable, and showed that any increase in the noise floor would constrain the development of more advanced satellite systems in the future. *Id.* at 27-28.

Other commenters agree that proceeding with implementation of the interference temperature concept, even on a limited basis, is unwarranted in licensed spectrum. The few parties that express some support for introduction of new services in satellite spectrum fail to provide a reasoned

[10] *See also* Cingular/BellSouth Comments at 50 (unclear what recourse would be available if unlicensed devices interfere with satellite links, as it likely would be "impossible to make changes to the satellite receiver in space or recall millions of unlicensed devices from the market").

basis for their arguments and do not address the critical flaws with the interference temperature proposal.

A. Commenters Oppose Application of the Interference Temperature Concept in Any Licensed Spectrum

The comments conclusively demonstrate that the Commission's proposal to try out the interference temperature approach in licensed spectrum is unjustified. There is broad consensus that the many fundamental questions regarding the approach and its implementation rule out any near-term reliance on interference temperature to introduce new services in licensed spectrum.

The New York State Wireless Network, for example, states that it "does not believe the interference temperature metric is mature enough to merit deployment," and that any experimentation with the approach "can only logically and fairly be done in a band that is pristine." NY SWN Comments at 41. Motorola agrees, commenting that:

> [C]onsideration of establishing interference metrics in any specific frequency bands, including those discussed in the *NPRM*, is premature until the FCC and the broad telecommunications industries reach a consensus on whether and how the metric can be effectively implemented without placing incumbent communications systems at greater risk to harmful interference.

Motorola Comments at 5.

Verizon Wireless states that the interference temperature concept is "not technically sound and cannot be supported by any proper economic analysis." Verizon Wireless Comments at 1. Cingular/BellSouth concurs,

calling the concept "unproven and untested," and arguing that any attempt to use interference temperature to pack more users into a band should be tried in spectrum already allotted for unlicensed use. Cingular/BellSouth Comments at ii.[11]

Unless and until the many threshold issues regarding the feasibility of this interference management technique have been resolved, any application of the interference temperature approach poses grave risks to licensed services. As a result, any trial run of the interference temperature approach should take place in spectrum where there are no licensed users.

B. Satellite Spectrum Must Not Be Used as a Test Bed for the Interference Temperature Concept

Several parties provide detailed criticism of the Commission's proposed choice of FSS uplink bands to test the interference temperature approach. The DIRECTV Group, for example, observes that the *Notice* suggests that FSS uplinks are appropriate for application of interference temperature concept because the licensed receiver that must be protected is located on the satellite in space. DIRECTV Group Comments at 10, *citing Notice* at ¶ 32. This argument, DIRECTV notes, "fails to recognize that the *desired* signal is no

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[11] *See also* Qualcomm Comments at 26 ("Qualcomm does not believe that the interference temperature metric should be applied to any of the licensed frequency bands"); Lucent Comments at 5 (unlicensed devices should operate in dedicated spectrum, not as underlay in licensed bands); Society of Broadcast Engineers Comments at 7 (interference temperature concept is technically unsound, impractical and unworkable); Luxon Comments at 11 (it is premature to implement an interference temperature metric that would permit unlicensed operations in licensed bands).

closer to the satellite receiver than the undesired signal is." *Id.* (emphasis in original). DIRECTV explains that the 36,000-kilometer distance between a noise source and a geostationary satellite does not make the satellite immune from interference because its receive antenna is expressly designed to pick up signals from 36,000 kilometers away. *Id.* In fact, the analysis in the *Notice* suggests that:

> [S]atellite uplink bands are peculiarly *inappropriate* for the interference temperature approach because virtually all satellite transmitter/receiver pairs operate near the maximum path length; there is no class of short paths which presumably have excess margin and can therefore easily tolerate a little extra noise.

Id. (emphasis in original; footnote omitted).

The parties demonstrate that the proposed use of FSS uplink spectrum is inconsistent with the Commission's theory that interference temperature concepts can be used to exploit "white space" within a band. Inmarsat points out that the *Notice* contemplates a situation in which unlicensed devices would "be able to take advantage of the increased carrier power that exists when a receiver is relatively close to its transmitter." Inmarsat Comments at 5, citing *Notice* at ¶ 15. However, this scenario is simply inapplicable to satellite services, because the satellite receiver is never close to the transmitter:

> In a satellite system there is no identifiable group of users or identifiable geographic area for which users have excessive margin which can be used to accommodate new spectrum users. Any

> increase in the aggregate interference margin would degrade service for many if not most satellite users.

Inmarsat Comments at 5. Similarly, Qualcomm states that:

> [U]se of the Delta T/T technique would not simply squeeze unlicensed devices into white space on the FSS band. Instead, this approach jeopardizes the performance of the licensed users on the FSS band.

Qualcomm Comments at 18.

Speaking from the viewpoint of a prospective new entrant, Shared Spectrum identifies other reasons why FSS bands are a poor choice for experimenting with the interference temperature approach. It notes that:

> Fixed Satellite bands don't offer significant RF performance or economic benefits that make it worth the private investment to develop and test the Interference Temperature concept. These . . . bands have poor propagation characteristics in terrestrial applications. There are already unlicensed and other bands available that provide similar propagation performance.

Shared Spectrum Comments at 18.

In contrast, a few parties suggest that satellite spectrum is appropriate for testing the interference temperature approach. These suggestions are unsupported by sound analysis and must be rejected.

Agilent Technologies acknowledges that many questions regarding interference temperature "remain unanswered and require further study," but argues that an initial implementation of the interference temperature concept in FSS uplink bands "has a reasonable chance for success." Agilent Comments at 2. Agilent envisions the operation of mobile unlicensed devices with fixed-

access points connected to the Internet. *Id.* at 6. Agilent explains that these terminals would seek permission to transmit from a central frequency server that would evaluate each request and issue short-term frequency "licenses" with specific technical parameters for the operation. *Id.* at 7.

There are a number of obvious flaws with Agilent's approach. First, Agilent recognizes that accurate measurements of interference temperature levels must be made, but does not propose a feasible approach to collecting them. At one point, Agilent seems to assume that the satellite would monitor interference temperature levels and report the results to the central frequency server. *See id.* However, as the Satellite Companies have previously explained, it is not practical or economical to deploy monitoring equipment on spacecraft. *See* SC Comments at 16-17. Furthermore, Agilent itself recognizes that enforcement of interference temperature limits is a critical consideration. Agilent Comments at 8. However, Agilent's only suggestion regarding enforcement is that the Commission deploy "a permanent grid of monitoring stations" to "measure interference temperature, as well as observe, locate and document infractions and spectrum utilization." *Id.* at 8-9. This suggests that Agilent's proposal would require interference temperature monitoring by both satellites and a nationwide monitoring grid. Agilent does not address the huge costs of such a dual monitoring system, or attempt to show that those costs would be justified by any reasonable prospect of increased spectrum efficiency.

Other parties make vague suggestions regarding the suitability of satellite spectrum for application of the interference temperature approach.[12] However, none of these commenters proposes a workable means of implementing, monitoring and enforcing interference temperature limits. To the contrary, each of these parties makes clear elsewhere in its comments that it has concerns about the interference temperature concept.[13]

Thus, the weight of the evidence before the Commission clearly demonstrates that the proposal in the *NPRM* to apply interference temperature concepts on an initial basis in satellite spectrum is fatally flawed. The Commission must resolve the basic questions regarding the interference temperature approach before it considers implementing that approach in spectrum licensed to satellite operators or any other service providers.

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[12] *See* IEEE 802 Comments at 7 (suggesting that analysis in the *Notice* supporting proposed use of FSS spectrum to test interference temperature concept is adequate); Wi-Fi Alliance Comments at 3 (indicating that wireless LANs operating in FSS uplink spectrum are an example of a situation where interference temperature approach is more likely to be workable); ARRL Comments at 11 (if FCC is going to test interference temperature approach, which ARRL believes is ill-advised and premature, any tests should be confined to bands with only FSS or FS incumbents).

[13] *See* IEEE 802 Comments at 8 (recognizing that incumbent licensees are entitled to protection from harmful interference and recommending that the Commission proceed cautiously); Wi-Fi Alliance Comments at 6 (urging the Commission "to proceed with the utmost of caution, if at all, with even limited implementation of the interference temperature approach"); ARRL Comments at 3-8 (FCC lacks sufficient information or management tools to develop or implement an interference temperature metric).

V. CONCLUSION

For the foregoing reasons and those expressed in our initial comments in this proceeding, the Satellite Companies oppose the use of an interference temperature approach in satellite spectrum.

Respectfully submitted,

GLOBALSTAR, L.P. By: */s/ William F. Adler* Vice President, Legal and Regulatory Affairs Globalstar, L.P. 3200 Zanker Road San Jose, CA 95134	ICO GLOBAL COMMUNICATIONS By: */s/ Suzanne Hutchings* Senior Regulatory Counsel ICO Global Communications 2000 Pennsylvania Ave., N.W. Suite 4400 Washington, DC 20006
INMARSAT VENTURES LIMITED By: */s/ Alan Auckenthaler* Vice President Inmarsat Ventures Limited 1050 Connecticut Ave., N.W. Suite 100 Washington, DC 20036	INTELSAT GLOBAL SERVICE CORP. By: */s/ Milenko Stojkovic* Director, Telecommunications Policy & Regulatory Affairs Intelsat Global Service Corporation 3400 International Drive, N.W. Washington, DC 20008
LOCKHEED MARTIN CORPORATION By: */s/ Jennifer A. Warren* Senior Director, Trade & Regulatory Affairs Lockheed Martin Corporation 1725 Jefferson Davis Hwy, Suite 403 Arlington, VA 22202	LORAL SPACE & COMMUNICATIONS LTD. By: */s/ John P. Stern* Deputy General Counsel Loral Space & Communications Ltd 1755 Jefferson Davis Hwy, Suite 1007 Arlington, VA 22202

NEW SKIES SATELLITES By: */s/ Andrew R. D'Uva* Vice President and Associate General Counsel New Skies Satellites Rooseveltplantsoen 4 2517 KR, The Hague The Netherlands	NORTHROP GRUMMAN SPACE TECHNOLOGY By: */s/ Peter Hadinger* Director, Communications Initiatives Northrop Grumman Space Technology 1000 Wilson Blvd. Suite 2300 Arlington, VA 22209
PANAMSAT CORPORATION By: */s/ Kalpak S. Gude* Vice President, Gov't & Regulatory Affairs and Associate General Counsel PanAmSat Corporation 1801 K Street, N.W., Suite 440 Washington, DC 20006	SES AMERICOM, INC. By: */s/ Nancy J. Eskenazi* Vice President & Assoc. Gen'l Counsel SES AMERICOM, Inc. 4 Research Way Princeton, NJ 08540

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