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

In the Matter of	)	
	)	
Allocation and Designation of Spectrum for	)	
Fixed-Satellite Services in the 37.5-38.5 GHz,	)	IB Docket No. 97-95
40.5-41.5 GHz and 48.2-50.2 GHz Frequency	)	
Bands; Allocation of Spectrum to Upgrade Fixed	)	RM-8811
and Mobile Allocations in the	)	
40.5-42.5 GHz Frequency Band; Allocation of	)	
Spectrum in the 46.9-47.0 GHz Frequency Band	)	
for Wireless Services; and Allocation of Spectrum	)	
in the 37.0-38.0 GHz and 40.0-40.5 GHz	)	
Frequency Bands for Government Operations	)	

REPLY COMMENTS OF ASTROLINK INTERNATIONAL LLC

Astrolink International LLC ("Astrolink"), by its attorneys and pursuant to Section 1.415 of the Commission's Rules, 47 C.F.R. § 1.415, hereby submits its reply to the comments of other parties in response to the *Further Notice of Proposed Rulemaking* in the above-captioned proceeding, FCC 01-182 (rel. May 31, 2001) ("*Further Notice*"). Astrolink urges the Commission not to adopt its proposals to restrict fixed-satellite service ("FSS") operations in order to "fully protect" radio astronomy services. *See Further Notice* at ¶¶ 32-34.

I. BACKGROUND

The *Further Notice* sought comment on two measures intended to provide additional protection to radio astronomy in the 42.5-43.5 GHz band. First, the Commission asked whether it should adopt domestically a modified version of international footnote S5.551G that would impose strict power flux density ("PFD") limits on FSS systems. *Id*. at ¶ 32, footnote USXXX. Second, the Commission proposed to eliminate the allocation for Broadcast Satellite

Service ("BSS") operations in the 42-42.5 GHz band out of concern that the PFD limits would not adequately protect radio astronomy receivers in the adjacent band. *Id*. at ¶ 34.

In its initial comments, Astrolink demonstrated that adoption of the proposed PFD limits was premature and unsupported by evidence that the limits were needed to protect radio astronomy operations. Astrolink Comments at 3-6. Astrolink also opposed elimination of the BSS allocation at 42-42.5 GHz. *Id*. at 6-7.

The comments of other parties support Astrolink's position. Satellite industry commenters agree that the Commission should await resolution of technical issues by the international community prior to determining what protections are needed for radio astronomy operations in the U.S. and that the BSS allocation at 42-42.5 GHz should be retained. In contrast, the two parties that support the Commission's proposals on radio astronomy, the National Telecommunications and Information Administration ("NTIA") and the Committee on Radio Frequencies of the National Research Council ("CORF"), provide no rationale for the Commission to move forward with its proposals at this time. Therefore, based on the record in this proceeding, the Commission should postpone action on any steps that may be necessary to protect radio astronomy until the results of the pending international studies are available.

II. THE RECORD DEMONSTRATES THAT THE COMMISSION'S PROPOSALS REGARDING RADIO ASTRONOMY ARE PREMATURE

A. The Comments Support Deferral of Action on PFD Limits Pending Completion on International Studies

Several satellite industry commenters agree with Astrolink that the provisional PFD limits adopted by WRC-2000 that the Commission proposes to codify through footnote USXXX should not be used as the basis for Commission action. Instead, the parties support awaiting the completion of the ongoing international studies regarding the protection

requirements of the radio astronomy service and steps that both the radio astronomy community and satellite operators can take to decrease the risk of harmful interference.

The Boeing Company ("Boeing"), for example, states that:

> The Commission should permit ITU-R working parties to reconcile conflicting study data and reach consensus on an approach that can be adopted by WRC-03 before the Commission adopts its own protection measures for the radio astronomy service in the United States. Waiting until WRC-03 finalizes international interference protection measures for radio astronomy will help to ensure that satellite operators are able to operate pursuant to a consistent regulatory framework in all regions of the world.[1]

Hughes Communications, Inc. ("Hughes") notes that it believes that the out-of-band emission PFD limits provisionally adopted at WRC-2000 "can be significantly relaxed, while providing sufficient protection of radio astronomy operations."[2] As a result, Hughes urges the Commission not to adopt the provisional limits pending further study. *Id*. Similarly, both Intelsat Global Service Corporation ("Intelsat") and TRW Inc. ("TRW") argue that decisions regarding protection of radio astronomy should be deferred until after the ITU-R completes its analysis of the issue.[3]

In contrast, both NTIA and CORF support the adoption of proposed footnote USXXX.[4] However, neither provides any rationale for codifying provisional limits that are likely to be revised at the next World Radio Conference.

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[1] Boeing Comments at 12.

[2] Hughes Comments at 11.

[3] Intelsat Comments at 7; TRW Comments at 18.

[4] *See* NTIA Comments at 3; CORF Comments at 5. CORF even goes so far as to argue that the limits contained in proposed footnote USXXX are not strict enough with respect to geostationary orbit satellites. *Id*. Astrolink responds to that argument in the following section.

On balance, the Commission must conclude that its proposal to adopt footnote USXXX as a domestic requirement is premature. Instead, the Commission should await the outcome of the pending international studies and evaluate those results prior to proposing measures for protection of U.S. radio astronomy services.

B. The Provisional PFD Limits Are Not Supported by the Record

The comments also demonstrate that the provisional PFD limits embodied in proposed footnote USXXX are unnecessarily restrictive and would seriously impair FSS operations. In its initial comments, Astrolink observed that actual protection requirements of U.S. radio astronomy sites vary significantly based on their technical characteristics and that very few sites even conduct observations in bands in the 40 GHz range. However, the provisional limits take an extremely conservative, one-size-fits-all approach to protecting radio astronomy observations. *See* Astrolink Comments at 4-5.

Other parties agree. Intelsat notes that "relatively few" radio astronomy stations make use of the 42.5-43.5 GHz band.[5] TRW points out that ITU-R RA.769-1, from which the provisional limits are taken, reflects unrealistically conservative assumptions regarding the performance of radio astronomy antennas. Specifically, the document's calculations assume an antenna gain of 0 dBi at 19º off-axis angle. In fact, however, the typical radio astronomy antenna gain at that angle is at least –15 to –20 dBi.[6]

A recent U.S. document submitted to Working Party 4A also confirms Astrolink's demonstration that appropriate protection levels differ substantially depending on the type of

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[5] Intelsat Comments at 7.

[6] TRW Comments at 17. *See also* Hughes Comments at 11 (provisional limits could be significantly relaxed without impairing protection of radio astronomy); Satellite Industry Association ("SIA") Comments at 4 (provisional limits reflect overly conservative assumptions).

radio astronomy operations being conducted and the applicable antenna configuration. Document 4A/279[7] states that the "detrimental interference thresholds"[8] for radio astronomy in the 42.5-43.5 GHz band range from –227 dB(W/m^2/Hz) for continuum observations using a single dish telescope to –173 dB(W/m^2/Hz) for observations using very long baseline interferometry ("VLBI") arrays, which "are considerably less sensitive to interference than single antennas." *Id*. at 11-12. Given this wide variation in sensitivity to interference among radio astronomy receivers, the Commission's proposal to adopt a single limit for satellite out-of-band emissions cannot be justified. Furthermore, CORF's own comments show that the vast majority of radio astronomy sites in the U.S. employ the more robust VLBI antenna arrays.[9]

In addition, Astrolink's comments described the serious impact that adoption of the provisional limits would have on the ability of FSS systems to provide cost-effective service. Specifically, Astrolink showed that installing filtering equipment needed to comply with the limits would either significantly decrease the capacity of an FSS satellite or significantly increase its weight and cost. Astrolink Comments at 5-6. TRW concurs that FSS systems would find it very difficult to comply with the provisional PFD limits. Specifically, TRW notes that the limits

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[7] "Working Document Toward Draft CPM Text, Potential impact on FSS and BSS service systems planning to operate in the 40.5-42.5 GHz band of meeting the detrimental interference threshold criteria of Recommendation ITU-R RA.769-1 for radio astronomy receivers operating in the 42.5-43.5 GHz band" (received Sept. 24, 2001).

[8] These are criteria identified by the radio astronomy community as protection levels and do not reflect satellite industry input regarding appropriate inter-service compatibility criteria.

[9] *See* CORF Comments at 7.

contained in proposed footnote USXXX are "25 dB more stringent than the lowest emission level that can be achieved by existing GSO FSS systems operating in the C- and Ku-bands."[10]

The evidence provided by the satellite community stands in stark contrast to the comments of NTIA and CORF. These parties support adoption of the provisional limits but present no technical support for their assertion that those limits are needed to protect radio astronomy operations.[11] Nor is there any support for CORF's claim that the limits applicable to GSO systems need to be even more restrictive: 15 dB lower than the limits reflected in footnote USXXX. *Id.*

CORF bases its assertion on Annex 1 to Recommendation ITU-R RA.769. *Id.* However, as discussed above, that document is based on a specific set of conservative assumptions regarding the protection requirements of radio astronomy services. Included in this set of assumptions is a radio astronomy antenna pattern with an antenna gain of 0 dBi at 19 degrees off-axis. As noted above, that assumption is clearly at odds with the actual performance of U.S. radio astronomy observatories. Furthermore, ITU-R RA.769 itself recommends that the radio astronomy community implement further improvements in antenna performance to reduce the susceptibility of radio astronomy receivers to harmful interference.[12]

The CORF request for an additional 15 dB of protection from GSO FSS systems is also at odds with the most recent U.S. inputs to Working Party 4A. Specifically, document

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[10] TRW Comments at 18 (footnote omitted). *See also* SIA Comments at 4 (meeting the protection criteria proposed by the radio astronomy community would have a "palpable negative impact on adjacent band services").

[11] NTIA Comments at 2-3; CORF Comments at 5.

[12] Recommendation ITU-R RA.769-1 at 4 ("the design of new radioastronomy antennas should strive to minimize the level of side-lobe gain near the main beam as an important means of reducing interference from transmitters in the GSO").

4A/279[13] identifies the detrimental interference criteria for radio astronomy in the 42.5-43.5 GHz band, and makes no distinction between protection figures applicable to geostationary and nongeostationary satellite systems. *Id*. at 11. This document was agreed within the U.S. National Committee, which includes representatives from the radio astronomy community, the FCC, NTIA, the State Department, and the satellite community. Thus, the suggestion by CORF that radio astronomy services require an additional 15 dB of protection from GSO FSS systems beyond what is specified in the provisional limits clearly is inconsistent with the current U.S. position on that issue.

The Commission cannot move forward with a proposal based on the provisional PFD limits given the serious concerns that have been raised regarding whether the limits reflect the actual protection requirements of U.S. radio astronomy sites and the serious adverse impact compliance with the limits would have on FSS operations. Instead, the Commission should undertake a balanced inquiry into appropriate protections for U.S. radio astronomy after completion of the ongoing international studies on this issue.

C. The Commission Should Not Delete Satellite Allocations in Order to Protect Radio Astronomy

Finally, the record supports Astrolink's position that the Commission should not delete satellite allocations in order to protect radio astronomy from harmful interference. The *Further Notice* sought comment on a proposal to delete the BSS allocation from the 42-42.5 GHz band because of concern that applying PFD limits to BSS operations in that band would not sufficiently protect radio astronomy. *Further Notice* at ¶ 34. However, the Commission also

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[13] "Working Document Toward Draft CPM Text, Potential impact on FSS and BSS service systems planning to operate in the 40.5-42.5 GHz band of meeting the detrimental interference threshold criteria of Recommendation ITU-R RA.769-1 for radio astronomy receivers operating in the 42.5-43.5 GHz band" (received Sept. 24, 2001).

noted that it was not proposing to allocate the 42-42.5 GHz band to FSS, despite the adoption of such an allocation by WRC-2000. *Id*. Astrolink agrees with the parties who support retaining both a BSS allocation and an FSS allocation in the 42-42.5 GHz band.

As a threshold matter, there is simply no reason to believe that PFD limits will be insufficient to protect radio astronomy observatories from harmful interference. As Astrolink observed in its initial comments, the limits the Commission is considering were developed by the radio astronomy community based on a conservative set of assumptions.[14]

Several commenters note that deletion of the BSS allocation at 42-42.5 GHz is premature prior to completion of the ongoing studies on the protection requirements of radio astronomy services.[15] In addition, TRW points out that the Commission's proposal not to include an allocation for FSS at 42-42.5 GHz is inconsistent with the position the U.S. took at WRC-97 and WRC-2000.[16] Hughes and Intelsat also support making the 42-42.5 GHz band available for FSS.[17]

NTIA and CORF support deletion of these satellite allocations, but once again fail to provide evidence to bolster their views.[18] CORF simply claims that it will be "difficult" for BSS operators at 42-42.5 GHz to filter their emissions in order to protect radio astronomy.[19] In

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[14] Astrolink Comments at 6-7.

[15] *See, e.g.*, Boeing Comments at ii; Hughes Comments at 8-9; TRW Comments at 18.

[16] TRW Comments at 15.

[17] Hughes Comments at 8; Intelsat Comments at 7.

[18] NTIA Comments at 2-3; CORF Comments at 4-5.

[19] CORF Comments at 4.

addition, CORF argues that it would be "difficult and costly" for radio astronomy observatories to reduce their susceptibility to interference. *Id*.

As discussed above, however, CORF's assumptions regarding the protection requirements of radio astronomy receivers are based on conservative parameters. Astrolink agrees with TRW that, depending on the type of radio astronomy facility and observations being conducted in this band, satellite systems may be able to meet the actual protection requirements of U.S. radio astronomy operations.[20] Astrolink recognizes that significant effort will be required by both satellite systems and radio astronomy operators to co-exist in adjacent bands. However, with the limited number of U.S. radio astronomy observatories operating in this band, and with international studies still ongoing, it is certainly premature to conclude that such co-existence is impossible. Accordingly, the Commission should make the 42-42.5 GHz band available for both BSS and FSS pending further study of compatibility issues involving radio astronomy.

III. CONCLUSION

The record here strongly supports awaiting completion of international analysis of interference issues before the Commission considers what steps are appropriate to permit both satellite services and radio astronomy reasonable access to spectrum in adjacent bands. The

[20] TRW Comments at 15-16.

Commission should therefore reject its proposed footnote USXXX, retain satellite allocations in the 42-42.5 GHz band, and revisit the protection of radio astronomy once international studies have been completed.

Respectfully submitted,

Astrolink International LLC

By: /s/ Karis A. Hastings

Peter A. Rohrbach
Karis A. Hastings
Hogan & Hartson L.L.P.
555 Thirteenth Street, N.W.
Washington, D.C. 20004
(202) 637-5600

Its Attorneys

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