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Policy Branch
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In the Matter of	)	
Mobile Satellite Ventures Subsidiary LLC	)	
	)	
Application for Modification of Space Station License (AMSC-1)	)	File No. SAT-MOD-20031118-00333
	)	
Amendment to Pending Application to Launch and Operate a Next-Generation Replacement MSS Satellite System	)	File No. SAT-AMD-20031118-00332
	)	
Application for a Modification of Blanket License to Operate Mobile Earth Terminals with MSAT-1	)	File No. SES-MOD-20031118-01879

OPPOSITION OF INMARSAT VENTURES LTD

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SUMMARY

Inmarsat Ventures Limited ("Inmarsat") opposes the Ancillary Terrestrial Component ("ATC") applications filed by the Mobile Satellite Ventures Subsidiary LLC ("MSV") (collectively, the "*ATC Application*") because MSV fails to provide necessary information and fails to make the demonstrations required under the Commission's rules. Moreover, the waivers and variances in the *ATC Application*, if granted, would (i) result in an ATC system that is significantly different in nature and scope than the Commission's "reference" ATC system and (ii) generate harmful uplink and downlink interference into Inmarsat's MSS system.

MSV seeks to deploy an ATC system far different than that contemplated by the ATC service rules and in the *ATC Order*. The Commission sought in the *ATC Order* to balance the goals of enabling the efficient use of spectrum with the need to preserve the international Mobile Satellite Service ("MSS"). In striking this balance, the Commission made absolutely clear that ATC, while permissible, must be an ancillary, integrated service that will remain *secondary* to the primary MSS service in the L-band. The Commission established gating criteria and rules that guaranteed that an ATC operator would remain first and foremost an MSS operator and that its deployment of ATC would not adversely impact the MSS service of either other operators or the ATC licensee.

MSV has filed an ATC application that would turn the Commission's policies and goals on their head. The *ATC Application* demonstrates that MSV plans to deploy a massive terrestrial service that would be more robust than its current MSS network and, in fact, would harm MSS operations in the L-band. MSV seeks <u>twelve</u> waivers or variances from the framework that the Commission adopted for the deployment of ATC. These waivers and variances are not minor changes, but instead would (i) dramatically increase the number of ATC

base stations far beyond the limit specified in the rules and thereby significantly increase the level of ATC interference into Inmarsat's and MSV's MSS services; (ii) threaten navigation and safety of life services provided by Inmarsat by loosening the interference protections provided to airplanes and ships that rely on service to aeronautical and maritime mobile terminals; and (iii) eliminate any restriction on the total number of ATC terminals that MSV may operate at any given time.

As an initial matter, MSV's *ATC Application* is legally deficient because it fails to make certain showings required under the Commission's rules. Thus, it should be dismissed. In particular, MSV fails to demonstrate that its ATC mobile terminals will be limited to a peak EIRP level of 0 dBW as required by Section 25.253(g)(1). MSV also fails to demonstrate that the cellular structure of its proposed ATC network will comply with the critical requirement that 18 dB of its ATC link margin be used solely for building penetration and not used otherwise. Finally, MSV seeks a variance to use a CDMA architecture, but fails to demonstrate how MSV's CDMA system would comply with Sections 25.253(a)(2) and (3) of the ATC service rules, and fails to make a corresponding reduction in the maximum number of ATC base stations. Accordingly, pursuant to the Commission's clear requirement that satellite applications be substantially complete when filed, and recent Commission precedent dismissing incomplete satellite applications, the *ATC Application* should be dismissed.

As to the waivers that MSV seeks, the reasons MSV provides in support of its requests do not meet the high standard necessary to justify the grant of a waiver by the Commission. Many of the waiver requests are "justified" simply by a restatement of arguments made by MSV in the ATC rulemaking proceeding and therefore constitute an attempt to relitigate the substance of the ATC service rules. Moreover, MSV does not provide a demonstration why the ATC rules specifically adopted in a rulemaking to constrain ATC in the L-band should not be applied to MSV's particular situation. Federal courts are explicit on these points: "[A] heavy burden traditionally has been placed upon one seeking a waiver to demonstrate that his arguments are substantially different from those which have been carefully considered at the rulemaking proceeding." *Industrial Broadcasting v. FCC*, 437 F.2d 680, 683 (D.C. Cir. 1970) (citing *WAIT Radio v. FCC*, 418 F.2d 1153, 1156 (D.C. Cir. 1969)). MSV simply does not meet its burden.

Moreover, many of waivers sought by MSV would result in an increase in harmful uplink and downlink interference from ATC into Inmarsat's MSS network. Unhappy with the limit on the maximum number of ATC base station frequency re-uses adopted in the *ATC Order*, MSV attempts a four-pronged attack on the limit. MSV asserts that the limit should be <u>increased from 1,725 to 29,571</u> based on (i) the Commission requiring Inmarsat to suffer significantly more interference from ATC operations – a level far beyond that provided in the *ATC Order*, (ii) MSV's plan to deploy proportionally more of its ATC base stations in the U.S. than in Canada, (iii) MSV's focus on a parameter of its mobile terminals that has not changed since the ATC rulemaking proceeding – the "average" gain of the antenna, and (iv) MSV's new theoretical self-interference cancellation technique that does absolutely nothing to protect Inmarsat from interference.

An increase in the number of ATC base station re-uses based on any of these theories would significantly increase the level of ATC interference into Inmarsat spacecraft and would completely undermine the uplink interference protection provided by the ATC service rules. Moreover, increasing the number of permitted ATC base stations as MSV proposes would be fundamentally inconsistent with the 18-month phase-in period that the Commission adopted to ensure that ATC, as actually deployed, does not harm the safety-of-life services that Inmarsat provides, or any other Inmarsat services.

None of MSV's other waivers relating to uplink interference into Inmarsat is justified. MSV's request to use half-rate vocoders instead of the quarter-rate vocoders required by the Commission is based on a misunderstanding of the Commission's analysis and, if granted, would increase the level of harmful uplink interference into Inmarsat. The other limitations for which MSV seeks a waiver were specifically adopted by the Commission to limit self-interference into MSV's satellite operations, as well as protect MSS operators in the L-band. MSV's proposal to expand its ATC deployment by waivers that would (i) allow unlimited reuse of L-band frequencies that MSV does not today share co-channel with other L band satellite operators, and (ii) eliminate the 90,000 mobile terminal "peak traffic" limit on its ATC system are based on arguments that the Commission was aware of during the course of the ATC rulemaking proceeding, and rejected. The Commission's reasoning for adopting these limits holds true. Thus, no waiver of those rules is warranted.

Finally, MSV seeks a series of waivers that seek to substantially relax the Commission's restrictions on the operation of base stations near airports and waterways. The Commission's rules were adopted to protect Inmarsat mobile terminals that are used to provide vital navigation and safety-of-life services to people on ships and airplanes. At their core, MSV's arguments in support of the waiver requests are based on the assertion that Inmarsat's mobile terminals are less sensitive than the Commission assumed when developing the ATC service rules. Testing by the manufacturers of those terminals, however, refutes this assertion and demonstrates that the terminals are in fact more sensitive than assumed by the Commission. Inmarsat, therefore, urges the Commission to deny MSV's waiver requests.

When placed in perspective, the *ATC Application* is not an application for an "ancillary" terrestrial service. The application is one for a terrestrial system with an ancillary satellite component. If the waivers and variances that MSV seeks are granted, MSV would become exactly the type of operator that the Commission sought to avoid – a primarily terrestrial operator with a sideline satellite service. Moreover, this "terrestrial" operator would generate harmful interference that would degrade the MSS service of Inmarsat. Inmarsat therefore urges the Commission to dismiss or deny MSV's *ATC Application*.

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OPPOSITION OF INMARSAT VENTURES LTD

Inmarsat Ventures Limited ("Inmarsat") hereby opposes the above-cited applications filed by Mobile Satellite Ventures Subsidiary LLC ("MSV") (collectively, the "*ATC Application*") by which MSV seeks authorization to operate an Ancillary Terrestrial Component ("ATC") service that radically departs from the framework adopted by the Commission in the *ATC Order*.[1] MSV proposes an ATC offering that will dwarf its Mobile Satellite Service ("MSS") and cause harmful interference into Inmarsat's MSS network. Because the service rules adopted in the *ATC Order* are designed to prevent just this from occurring, MSV has been forced to seek a multitude of waivers and variances that effectively seek to relitigate substantive matters already decided by the Commission in the *ATC Order*. If granted, MSV's requested

1 *See Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, Report and Order*, 18 FCC Rcd 1962 (2003) (the "*ATC Order*"), *amended by Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, Errata*, IB Docket Nos. 01-185 and 02-364 (March 7, 2003).

waivers would amount to a piecemeal decimation of a carefully crafted ATC regulation regime. MSV's proposed ATC system would result in MSV causing harmful interference to Inmarsat's MSS services and MSV becoming exactly the type of operator that the Commission sought to avoid – a primarily terrestrial operator with a sideline satellite service.

BACKGROUND

Over three years ago, MSV filed an application to launch a next generation satellite and also requested authority to integrate ATC into its MSS operations. In response to that and other ATC applications, the Commission issued a notice of proposed rulemaking seeking comment on the possible benefits of such a service and the harms such a service could cause. For the next two years, many interested parties, including Inmarsat and MSV, filed volumes of comments and analysis on the potential impact of ATC on MSS operations. During the course of the proceeding, MSV repeatedly asserted to the Commission that it sought authorization to deploy an ATC offering that would be limited in scope: (i) reuse ATC channels a maximum of 2000 times CONUS-wide,[2] (ii) have a peak traffic limit of 90,000 mobile ATC terminals;[3] (iii) limit degradation to MSV's satellite service to 6% $\Delta T/T$ by consuming only 0.25 dB of MSV's link margin,[4] (iv) ensure that its ATC operation would contribute no more than 1%

2 *See, e.g., Comments of Mobile Satellite ventures Subsidiary LLC*, IB Docket No. 01-185 at Figure 6 (March 22, 2002) ("*March 22, 2002 MSV Comments*"); Letter from MSV to Secretary, FCC, *ex parte Letter*, IB Docket No. 01-185 at Ex. A p. 25 (filed January 13, 2003) ("*January 13, 2003 MSV Presentation*").

3 *See, e.g.*, Letter from MSV to Secretary, FCC, *ex parte entitled "MSV's Next Generation Satellite System Coordination and Interference Considerations*, IB Docket No. 01-185 at 22 (filed February 6, 2002) ("*February 5, 2002 MSV Presentation*").

4 *See, e.g., February 5, 2002 MSV Presentation* at 4, 21; *March 22, 2002 MSV Comments* at Figure 5; *March 28, 2002 MSV Ex Parte Presentation entitled "Monitoring and Control of Ancillary Terrestrial Emissions by MSV's Space Segment" prepared by Peter Karabinis, VP & Chief Technical Officer of MSV*, IB Docket No. 01-185 at 11 ("MSV demonstrated that only 0.25 dB of link margin need be expended by its SS links to

additional interference level into Inmarsat's satellites,[5] and (v) deploy sophisticated base station antennas with highly directional gain patterns that would constrain ATC interference into airplanes that rely on Inmarsat for navigation and safety of life purposes.

Inmarsat opposed ATC in the L-band on technical grounds, and questioned the feasibility of many of MSV's proposals for how MSV would implement ATC. The principal concerns of Inmarsat in the ATC proceeding are (i) to ensure that Inmarsat's MSS operations are protected from unacceptable levels of interference and (ii) whether MSV actually would limit its ATC ambitions to comport with its repeated representations to the Commission.

The *ATC Order* struck a compromise by seeking to "balance[] the traditional goals of effective and efficient use of spectrum with preserving the optimal amount of spectrum for the provision of international satellite services."[6] Thus, the Commission determined that it would allow MSS operators to deploy an ATC service but only if the operator (i) met specific gating criteria[7] and (ii) strictly complied with technical operating limits promulgated by the Commission to protect against harmful interference.[8] The ATC framework established by the Commission for the L-band adopted neither MSV's nor Inmarsat's positions wholesale, but rather crafted a middle ground that neither party was completely satisfied with, but that, with minor adjustments,[9] serves the Commission's goals of spectrum flexibility and protecting MSS

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accommodate the intra-system co-channel effect of the ATC.") ("*Karabinis Paper*"); *January 13, 2003 MSV Presentation* at Ex. A p. 4.

5 *See, e.g., February 5, 2002 MSV Presentation* at 5; *January 13, 2003 MSV Presentation* at Ex. A, p.5.

6 *ATC Order* at ¶ 2.

7 *See ATC Order* at ¶¶ 66-101.

8 *See ATC Order* at ¶¶ 128-188.

9 Inmarsat has sought certain clarifications and the reconsideration of minor issues that are designed to ensure that Inmarsat's MSS operations are adequately protected. *See Petition*

operations. It is noteworthy that the protections for MSS operations in the L-band adopted by the Commission allow the deployment of an ATC system whose specifications are very close to those MSV had asserted throughout the proceeding that it needed (*e.g.* the FCC adopted a co-channel reuse limit of 1,725 while MSV had claimed that its ATC system would have a maximum reuse of 2,000).[10]

Now, a year later, everything that MSV once promised has been cast aside, and MSV has initiated a collateral attack on the Commission's ATC operating limits by seeking an unprecedented series of waivers of the ATC service rules. As detailed below, MSV's *ATC Application* is both technically and legally deficient and must be dismissed or denied as fundamentally inconsistent with the ATC service rules.

DISCUSSION

I. OVERVIEW OF MSV ATC APPLICATION

Since the issuance of the *ATC Order*, it has become evident that MSV does not seek to deploy a limited ATC service as it represented throughout the rulemaking proceeding, but instead desires to build an expansive terrestrial network that is far beyond the scope envisioned by the Commission. The *ATC Order* clearly describes the type of "reference" ATC system that the Commission has determined protects MSS operations and could be approved in short order. The ATC system sought by MSV in its *ATC Application* does not fall within that framework. Instead MSV (i) seeks authorization to deploy a much larger ATC system and (ii) requests waivers and variances that effectively gut the interference protections provided by the ATC service rules. The vast majority of the arguments asserted by MSV in support of its

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for Reconsideration and Clarification of Inmarsat Ventures PLC, IB Docket No. 01-185 (July 7, 2003) ("*Inmarsat Petition*").

10 *See, e.g., March 22, 2002 MSV Comments* at Figure 6; January 13, 2003 MSV Presentation at Ex. A, p.25.

application are a rehashing of what MSV has said before. These arguments either have been raised and rejected in the NPRM portion of the ATC rulemaking proceeding or fully briefed in the reconsideration phase.

Although MSV characterizes it as "few instances" where it seeks "flexibility to vary from the specific technical rules,"[11] there in fact are <u>twelve (12) technical waivers or variances sought by MSV</u>. Specifically, MSV requests:

1) A waiver to increase the number of ATC base stations above the 1725 limit based on:

   a. Requiring Inmarsat to accept a significant increase in uplink interference to a total of 6% $\Delta T/T$;[12]

   b. MSV's plans to deploy 80 percent (rather than 50 percent) of its ATC base stations in the United States;[13]

   c. The assertion that MSV's mobile terminals have an average antenna gain calculated to be –4 dBi or less when operating in the "ATC mode," but an unspecified EIRP;[14] and

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11 *ATC Application* at 2.

12 *ATC Application* at 12. *See also, e.g.,* Letter from MSV to Secretary, FCC, *ex parte* letter, IB Docket no. 01-185 at 1 (filed January 28, 2003) ("*January 28, 2003 MSV ex parte*"); Letter from MSV to Secretary, FCC, *ex parte* letter, IB Docket No. 01-185 at 2 (filed January 24, 2003); Letter from MSV to Secretary, FCC, *ex parte* letter, IB Docket no. 01-185 at 1 (filed January 21, 2003); cf., *e.g.,* Letter from Inmarsat to Secretary, FCC, *ex parte* presentation entitled "*Terrestrial Use of the L-Band,*" IB Docket No. 01-185 at 17 (filed November 5, 2002); Letter from Inmarsat to Secretary, FCC, *ex parte* letter, IB Docket No. 01-185 at 2-3 (filed January 10, 2003); Letter from Inmarsat to Secretary, FCC, *ex parte* letter, IB Docket No. 01-185 at 1-2 (January 23, 2003); *see also See Petition For Partial Reconsideration and Clarification of Mobile Satellite Ventures Subsidiary LLC,* IB Docket No. 01-185 at 9 (July 7, 2003) (the "*MSV Petition*"); cf. *Inmarsat Opposition to Petition For Partial Reconsideration and Clarification of Mobile Satellite Ventures Subsidiary LLC,* IB Docket No. 01-185 at 9-11 (August 20, 2003) ("*Inmarsat Opposition*"). Most of MSV's requests are a reiteration of issues raised earlier in the ATC proceeding. Where this is true, Inmarsat cites in the footnotes to this Section I where the issue was raised and to certain relevant filings related to the subject.

13 *ATC Application* at n. 27. *See MSV Petition* at 6; cf. *Inmarsat Opposition* at 6-8 and Opposition Technical Annex § 2.1.

d. MSV's proposed use of a self-interference cancellation technique that purportedly will prevent ATC from increasing MSV's noise floor by more than 6% $\Delta T/T$, but has no impact on the ATC interference generated into Inmarsat;[15]

2) A waiver of the requirement to use quarter-rate vocoders as specified by the *ATC Order*;[16]

3) A waiver to permit the unlimited use of those frequencies not used by Inmarsat (or any other MSS operator) anywhere in the world that could be visible from the ATC service area;[17]

4) A waiver of the rule that L-band ATC base stations not exceed a peak EIRP of 19.1 dBW, in a 200 kHz per carrier, with no more than three carriers per sector[18] such that MSV may operate ATC base stations with an aggregate EIRP per sector of up to 38.9 dBW EIRP provided the aggregate EIRP of all the base stations within a 50 mile radius does not exceed 58.3 dBW in any given direction;[19]

5) A waiver of the rule that L-band ATC base stations not exceed an EIRP toward the physical horizon (not to include man-made structures) of 14.1 dBW per carrier in 200 kHz such that MSV may operate its ATC base stations with an aggregate EIRP per sector of up to 33.9 dBW toward the physical horizon (not to include man-made structures);[20]

6) A waiver of the rule protecting aeronautical MSS services such that MSV's ATC base stations may either: (i) be located at least 470 meters from any airport runway or aircraft stand area, including takeoff or landing paths; or

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14 *ATC Application* at n. 27.

15 *ATC Application* at 12.

16 *ATC Application* at 13-14 & n. 245. *See also MSV Petition* at 14; cf. *Inmarsat Opposition* at 15 and Opposition Technical Annex § 3.

17 *ATC Application* at n. 27. *See also* Letter from Lon Levin, MSV, to Marlene H. Dortch, Secretary, FCC (Jan. 16, 2003).

18 *See* 47 C.F.R. § 25.253(d)(1).

19 *ATC Application* at n. 30. *See also MSV Petition* at 16-19; cf. *Inmarsat Opposition* at 15-16 and Opposition Technical Annex § 4.

20 *ATC Application* at n. 31. *See also MSV Petition* at 18; cf. *Inmarsat Opposition* at 15-16 and Opposition Technical Annex § 4.

(ii) not exceed a PFD level of –49.6 dBW/m²/carrier at the edge of all airport runway or aircraft stand area, including takeoff or landing paths;[21]

7) A waiver of the rule requiring L-band ATC base stations to meet a PFD limit of –64.6 dBW/m²/200 kHz at the water's edge of any navigable waterway such that MSV's ATC base stations may either: (i) be located at least 1.5 km from the boundaries of all navigable waterways; or (ii) not exceed a PFD level of –54.4 dBW/m²/carrier at the water's edge of any navigable waterways;[22]

8) A waiver of the overhead gain suppression restrictions so as to allow MSV to relax the restriction by 10 dB over the range of elevation angles from 55° to 145° and by 8 dB over the range of elevation from 30° to 55°;[23]

9) A waiver of the 90,000 mobile terminal peak traffic limit;[24]

10) A variance to permit MSV to deploy ATC capable of supporting both GSM and CDMA air interface protocols;

11) A waiver to use another company's spacecraft to satisfy the satellite ground spare requirement; and

12) A variance from the use of a "safe harbor" dual mode handset necessary to demonstrate an integrated MSS/ATC system.[25]

Inmarsat does not take a position on (11) and (12) above, but each of the other requested waivers and variances constitutes a departure from the ATC service rules that threatens to undermine the Commission's carefully constructed ATC framework. As the Commission has emphasized: "We view full and complete compliance with each of the requirements as essential to the integrity of our 'ancillary' licensing regime."[26]

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21 *ATC Application* at n.32. *See also MSV Petition* at 20-22; cf. *Inmarsat Opposition* at 18-19 and Opposition Technical Annex § 6.

22 *ATC Application* at n.33. *See also MSV Petition* at 16-19; cf. *Inmarsat Opposition* at 15-16 and Opposition Technical Annex § 4.

23 *ATC Application* at n.35. *See also MSV Petition* at 19-20; cf. *Inmarsat Opposition* at 17-18 and Opposition Technical Annex § 5.

24 *ATC Application* at 24. *See also February 5, 2002 MSV Presentation* at 22.

25 *ATC Application* at 10.

26 *ATC Order* at ¶ 66 (emphasis added).

MSV's *ATC Application* demonstrates the continuation of a trend that should greatly concern the Commission. Throughout the ATC proceeding, MSV has repeatedly made promises and representations about the scope of its ATC service and the ability of its ATC system to avoid interference into MSS systems. Then, when the time comes to follow through on its promises, MSV comes up with some excuse or simply refuses to implement its proposed design.

For example, as mentioned above, MSV repeatedly claimed that its ATC offering would (i) reuse ATC channels a maximum of 2000 times CONUS-wide,[27] (ii) support a maximum of 90,000 simultaneously transmitting mobile terminals,[28] and (iii) contribute no more than a 1% $\Delta T/T$ interference level into Inmarsat's satellites.[29] All these representations have fallen by the wayside. MSV now seeks to (x) reuse ATC channels a maximum of 29,571 times CONUS-wide, (y) have an unlimited number of simultaneously transmitting mobile terminals and (z) contribute a full 6% $\Delta T/T$ interference level into Inmarsat's satellites.

MSV has also made representations about the ability of its mobile terminals and next generation satellite that have turned out to be unreliable. For example, from the outset, MSV proposed a base station antenna mask with certain specifications which the Commission relied on in analyzing MSV's ATC proposal.[30] MSV represented that it could produce such an

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27 *See, e.g., March 22, 2002 MSV Comments* at Figure 6 ; *January 13, 2003 MSV Presentation* at Ex. A p. 25.

28 *See, e.g., February 5, 2002 MSV Presentation* at 22.

29 *See, e.g., February 5, 2002 MSV Presentation* at 5; *January 13, 2003 MSV Presentation* at Ex. A, p.5.

30 *See, e.g., ATC Order*, Appendix C2 §§ 2.2.3.1 and 2.2.3.2.

antenna is a cost effective manner.[31] Immediately after the ATC service rules were promulgated, however, MSV came back in its Petition for Partial Reconsideration stating that such an antenna would be difficult to produce and expensive.[32] Now, MSV seeks a waiver of the overhead gain suppression limits that are based on the very antenna that MSV once promised would be feasible, asserting that a waiver somehow will allow the production of "higher performance, lower-cost equipment."[33] MSV also has made references to "patent-pending" techniques or other techniques that "may" be used to solve ATC interference problems. For instance, in its Petition for Partial Reconsideration, MSV asserted that to overcome self-interference from ATC it may employ a return link technique that relies on the operation of at least two in-orbit spacecraft.[34] Now MSV is silent on that proposal and has come up with a new and fanciful "interference cancellation" scheme.[35]

If trust is something that is earned, MSV is engaged in record deficit spending. Time and time again, MSV's promises have been shown to be empty. Inmarsat urges the Commission to factor this into consideration when evaluating MSV's *ATC Application* and the assurances MSV has made in its *ATC Application* about its plans to effectuate various technologies. Unless MSV's obligations are clear and unequivocal, MSV's past behavior indicates that it will provide the Commission with platitudes until it is time to perform – then MSV will find a convenient excuse for changing its plans.

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31 *See, e.g., Reply Comments of Motient Services, Inc., et al.*, IB Docket No. 01-185 at 15-16 (November 13, 2001) and attached CSS Antenna affidavit ("This makes this antenna a very cost effective choice for large scale Base Station deployment.").

32 *See MSV Petition* at 19.

33 *ATC Application* at 23 and n. 35.

34 *See MSV Petition* at 11.

35 *See ATC Application*, Appendix F.

In the aggregate, MSV's requests, if granted, would (i) significantly undermine the Commission's goal that ATC remain ancillary and (ii) eviscerate the interference protections provided by the *ATC Order*. Moreover, as described in detail below, those waivers and variances would result in a significant increase in interference into Inmarsat's MSS operations and also fundamentally change the ancillary nature of ATC in the L-band. Thus, Inmarsat urges the Commission to dismiss or deny MSV's *ATC Application*.

II. LEGAL STANDARD FOR REVIEWING MSV'S MYRIAD OF WAIVERS AND VARIANCES

At the outset, it is important to recognize that most of MSV's waiver requests are reiterations of arguments that MSV made in its Petition for Partial Reconsideration and constitute a relitigation of issues decided in the ATC proceedings. They are not legitimate waiver requests seeking authorization to deviate from the Commission's rules based on a specific showing that demonstrates why MSV is in a special position vis-à-vis other ATC applicants. While such an attempt to change the ATC service rules may be done in a reconsideration petition, it is inappropriate to seek "waivers" based on a disagreement with the Commission over the basis for the ATC service rules.

As detailed above, MSV seeks a dozen different waivers of, or variances from, the ATC service rules. These requests to "relax" for MSV the application of various ATC service rules fall into two broad categories: (i) requests to alter the application of service rules that otherwise would apply to MSV, through a waiver of the rule, and (ii) requests to vary MSV's system from the GSM ATC system architecture assumed by the Commission as a "baseline," or "reference" ATC system. This distinction is important because it establishes the relevant legal standard for reviewing MSV's requests.

In the case of varying from a GSM architecture, the Commission has allowed an applicant to propose a different system architecture, as long as the applicant demonstrates that such a system will not increase the interference that would be generated by a "baseline" system.[36] Only a few of MSV's requests fit into this category. MSV's request to use CDMA is premised on the use of such a protocol not causing an increase in interference, and therefore the request falls into the category of a variance for a different system architecture.[37]

Most of the remaining requests seek waivers from the ATC service rules. Despite MSV's posturing, the requests seeking to increase the co-channel reuse limit cannot be considered variances, because they are premised on increasing interference into Inmarsat and affect MSV's MSS service beyond the levels what is permitted in the rules.[38] Review of MSV's waiver requests are subject to a much more stringent legal standard then the variance requests.[39]

MSV bears the burden of demonstrating why the Commission should grant any of the waivers it seeks. "[A] heavy burden traditionally has been placed upon one seeking a waiver to demonstrate that his arguments are substantially different from those which have been carefully considered at the rulemaking proceeding." *Industrial Broadcasting v. FCC*, 437 F.2d 680, 683 (D.C. Cir. 1970) (citing *WAIT Radio v. FCC*, 418 F.2d 1153, 1156 (D.C. Cir. 1969)). To support its waiver requests, MSV must point to specific facts that distinguish it from other

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36 *See* 47 C.F.R. § 25.253 at Note.

37 As discussed below, however, MSV's showing is deficient, because it fails to demonstrate how the "vocoder factor" would be implemented for CDMA.

38 *See ATC Order* ¶ 147.

39 Indeed, as explained in greater detail below, MSV's request to increase the number of ATC base stations is fundamentally premised on significantly increasing ATC interference into Inmarsat's spacecraft to a level far greater than that that permitted under the ATC service rules.

parties subject to the rule. *See International Union of Painters & Allied Trades v. NLRB*, 309 F.3d 1, 5 (D.C. Cir. 2002) (denied waiver because the exception would swallow the rule).

Granting waivers that effectively would change the Commission's rules would undermine the purpose and intent of the rulemaking process. "[O]ne of the foremost advantages of rulemaking -- the formulation and effectuation of agency policy with a minimum expenditure of time and resources-- will not be undermined by the necessity for continuous case-by-case adjudication." *Industrial Broadcasting*, 437 F.2d at 683.

Thus, the Commission may grant MSV's requested waivers only if (1) special circumstances warrant a deviation from the general rule; and (2) such deviation will serve the public interest. *WAIT Radio*, 418 F.2d at 1159. To this end, FCC "must explain why deviation better serves the public interest and articulate the nature of the special circumstances to prevent discriminatory application and to put future parties on notice as to its operation." *Northeast Cellular Telephone Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990).

In Section IV below, Inmarsat addresses the merits of certain of MSV's waiver and variance requests and demonstrates why for those requests no special circumstances are present that support a deviation from the general rule.

III. MSV'S APPLICATION IS LEGALLY DEFICIENT

The Commission should dismiss MSV's application as incomplete because MSV has failed to comply with a clear requirement that it include three critical demonstrations:

(i) that its ATC mobile terminals shall "be limited to a peak EIRP level of 0dBW"[40];
(ii) that "the cellular structure of the ATC network design includes 18 dB of link margin allocated to structural attenuation;"[41] and

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40 47 C.F.R. § 25.253(g)(1)

41 47 C.F.R. § 25.253(a)(8)

(iii) that ATC mobile terminals reduce interference when an MT transmits above defined threshold EIRP levels.[42]

An application for an ATC authorization is a request to modify an MSS licensee's space station license.[43] As such, MSV's ATC applications are subject to the same processing rules as any other application for a space station authorization, or a modification thereof.

In its recent *First Space Station Reform Order,*[44] the Commission determined to continue to require that satellite applications be substantially complete when filed.[45] As the Commission noted, this enables the Commission to establish satellite licensees' operating rights clearly and quickly, and as a result, allows licensees to provide service to the public sooner.[46] Applying these principles in a number of cases since then, the Commission has dismissed as incomplete and unacceptable for filing a number of space station applications, determining that "[f]inding incomplete applications acceptable for filing is not consistent with the rules and policies adopted by the Commission in the *First Space Station Reform Order* and only serves to create uncertainty and inefficiencies in the licensing process."[47] In one case, the Commission dismissed an application because the applicant failed to include the requisite antenna gain contour.[48] In another case, the Commission dismissed three space station applications because

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42 47 C.F.R. § 25.253(a)(2) and (3).

43 *See ATC Order* at n.174 (requiring that ATC applications be filed on Form 312, and subjecting ATC applications to the same processing rules as space station applications).

44 Amendment of the Commission's Space Station Licensing Rules and Policies, *First Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 10760 (2003) ("*First Space Station Reform Order*").

45 *First Space Station Reform Order*, 18 FCC Rcd at 10852 (¶ 244).

46 In re PanAmSat Licensee Corp., DA 03-3633 at ¶ 6 (rel. Nov. 13, 2003) (order on reconsideration).

47 *Id.*

48 *Id.*

the applicant did not specify a stationkeeping tolerance that was consistent with Commission rules.[49]

In this case, MSV has failed to specify the peak power emitted by its ATC handsets, failed to demonstrate that its ATC architecture employs 18 dB of its link budget margin solely to overcome building penetration issues with users who are indoors, and failed to demonstrate how ATC MTs using its proposed CDMA architecture would reduce interference when an MT transmits above defined threshold EIRP levels. These requirements are clearly specified in the ATC service rules. As a result, MSV's *ATC Application* is incomplete and should be dismissed.

A. MSV's Fails To Demonstrate Compliance With Section 25.253(g)(1)

MSV has failed to demonstrate that its ATC mobile terminals comply with Section 25.253(g)(1), which requires that the ATC mobile terminal be limited to a peak EIRP level of 0 dBW. Nowhere in the *ATC Application* does MSV specify the peak EIRP level for its ATC mobile terminals. MSV carefully limits its disclosure to specifications about antenna gain of its mobile terminals, focusing on the "average" antenna gain of those terminals. According to MSV's latest analysis, the *average* EIRP for its mobile terminal will be -4 dBW or less when operating in ATC mode,[50] but this is only part of the story. MSV never clearly represents the level of power into the mobile terminal antennas, the peak gain of the antenna or the resulting peak EIRP of the terminal.

49 *See* Letter from Chief, Satellite Division, International Bureau, to Pegasus Development Corporation, dated November 19, 2003, File No. SAT-LOA-20030827-00169, Call Sign S2482; File No. SAT-LOA-20030827-00171, Call Sign S2484; File No. SAT-LOA-20031030-00319, Call Sign S2600.

50 *ATC Application* at n. 27, 18, 24.

Other information in the application suggests a peak mobile terminal power level of 1 watt (= 0 dBW),[51] and a peak antenna gain that varies from approximately +2.0 dBi in the case of the external stubby antenna that could be built into an ATC terminal (see Figure 4 of Appendix H to the *ATC Application*),[52] to +0.5 dBi in the case of an internal patch antenna that could be built into an ATC terminal. Thus, it would appear that the peak EIRP is +2 dBW, and therefore exceeds the limits of § 25.253(g)(1).

B. MSV Fails To Demonstrate That Its ATC Network Design Meets The Requirements Of Section 25.253(a)(8)

MSV has failed to comply with a clear requirement that it include a demonstration that the cellular structure of the ATC network design includes 18 dB of link margin allocated to structural attenuation. Section 25.253(a)(8) of the Commission's rules embodies a critical technical assumption underlying the Commission's decision to allow ATC in the L-band. The rule mandates that an L-band ATC system must be designed with at least an 18 dB link margin *used solely for building attenuation*.[53] This rule obligates the L-band ATC applicant to

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51 *ATC Application* at 24 (claiming that an average antenna gain of –4 dBi or less reduces the average EIRP level of mobile terminals "while in ATC mode" to –4 dBW or less) and at Appendix H, page 9 (applying a maximum PA output power of 0 dBW).

52 As noted below, Inmarsat believes that this theoretical gain pattern is not reliable. *See infra* note 81.

53 "Our analyses is [sic] based on the expectations that MSV will implement the full 18 dB of margin for structural attenuation that they state is 'per standard PCS design practices' and that they will implement the maximum dynamic range of power control contained in the GSM system specification." *ATC Order*, Appendix C2 § 1.3.5. MSV had represented that standard PCS design practices provide for 18 dB of building penetration margin at edge-of-cell coverage, with this maximum level of power increase being used only in the case of users "deep inside buildings." MSV Reply Comments, Technical Appendix at 6-7 (November 13, 2001).

demonstrate how it will comply with these operating conditions to ensure that its ATC system does not exceed the interference level assumed in the Commission's analysis.[54]

It is incumbent on MSV to explain how its system architecture will comply with this critical 18 dB structural attenuation requirement. Yet MSV once again fails to explain precisely how it will design its system to ensure compliance with Section 25.253(a)(8). In Section II.C(8) of its *ATC Application*, MSV refers the reader to its Appendix E, where MSV provides merely a description of one *possible* measure that MSV *might* be able to employ to ensure compliance with this rule.[55] MSV makes no commitment to implement this measure or any of the other "variety of ways" that MSV refers to but does not explain or even describe.[56] Worse yet, it is not even clear that MSV *will* comply with the clear requirement of Section 25.253(a)(8). MSV admits that there are cases where it will not comply with the 18 dB attenuation requirement: "If less structural attenuation is used, the maximum number of base stations permitted under Section 25.253(a)(9) will be reduced or a showing will be made that there would be no increase in interference to other MSS operators . . . ."[57]

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54 There is a typographical error in paragraph 142 of the *ATC Order*, which Inmarsat has requested be corrected. In that paragraph, the Commission references a 10 dB (versus an 18 dB) margin when discussing the required link margin for power control that is to be used solely for overcoming structural attenuation. At numerous points in the text and supporting analysis, *see, e.g.*, *ATC Order*, Appendix C2 § 1.2 and Table 1.14.A, the Commission states that it relies upon a structural attenuation of 18 dB to justify the interference limits it establishes in the new ATC service rules. *See ATC Order* ¶ 140. Thus, it is clear that the Commission assumes and relies upon a link margin of 18 dB to support the interference analysis upon which its Rules are based. It is only in paragraph 142, that a link margin of "10 dB" is used with reference to structural attenuation.

55 *See* MSV Consolidated Opposition to and Comments on Petitions for Reconsideration, IB Docket No. 01-185 (August 20, 2003) ("*MSV Opposition*").

56 As discussed below, the one method that MSV does describe fails to meet the requirement of ensuring that all terminals operating outdoors will reduce their EIRP by at least 18 dB.

57 *ATC Application* at 15-16.

These inadequacies are reason enough to reject the ATC applications as incomplete. The rules require a *demonstration* that the cellular structure of the ATC network design *includes* 18 dB of link margin allocated to structural attenuation.[58] Thus, it not sufficient for MSV to provide a theoretical textbook recitation of the ways that MSV "*can design* its ATC base stations." And while Section 25.253(a)(8) contemplates less attenuation being used in certain cases, with an appropriate showing, it is incumbent on the ATC applicant to make that showing *in its application*, not at some time in the future, after it is licensed, and its network has been deployed.

In order to ensure compliance with the 18 dB link margin requirement, it is critical that the Commission require that MSV provide a full description of the ATC architecture that it *actually will use* to comply with the Commission's rules, a full and detailed "demonstrat[ion] that the cellular structure of the ATC network design includes 18 dB of link margin allocated to structural attenuation,"[59] and an appropriate showing that this margin will be used only for indoor service. Indeed, just last year, in the context of revising its satellite licensing rules, the Commission rejected the idea that a licensee should be able to merely certify compliance with a license milestone.[60] Nor should such a certification be sufficient here, where the economic interests of the licensee and the practice in the industry are contrary to the dictates of the rule. In sum, the novel and untested nature of ATC systems, and the critical nature of this 18 dB requirement, warrant that the Commission require a clear and convincing showing how an applied-for ATC system will comply with Section 25.253(a)(8).

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58 *See ATC Order* at Appendix B § 25.253(a)(8).

59 *See id.*

60 *In the Matter of Amendment of the Commission's Space Station Licensing Rules and Policies and Mitigation of Orbital Debris*, First Report and Order and Further Notice of Proposed Rulemaking, IB Docket No. 02-34 and 02-54 at ¶ 185 (rel. May 19, 2003).

C. MSV's Fails To Demonstrate How Its CDMA Architecture Would Comply With The Requirements Of Sections 25.253(a)(2) and (3)

MSV seeks authority from the Commission to deploy its ATC service using either (i) GSM-only architecture, (ii) CDMA-only architecture or (iii) a combination of the two.[61] In support of this, MSV declares that regardless of the architecture it uses it will limit inter- and intra-system interference to the levels permitted by the Commission.

In Appendix B to the *ATC Application*, MSV expands on how the Commission's rules, which are based on a TDMA architecture, should be applied to a CDMA or combined system. With respect to the adaptation of the limit on the number of co-channel reuses depending on which combination of technologies MSV finally deploys, Inmarsat agrees with the derivation of the equation N/8 + M/50 + L/200 = R proposed by MSV.

The interference reduction measures that are the basis of Sections 25.253(a)(2) and (3) rely on corresponding reductions in channel occupancy when an MT needs to transmit above defined threshold EIRP levels. In TDMA, this is achieved by requiring that time slots in the TDMA waveform be left vacant. There is no obvious analogy applicable to the case of CDMA, and MSV has failed to mention how it will achieve the necessary interference reduction for MTs using CDMA. Nevertheless, the equivalent interference reduction should be incorporated into any CDMA architecture that is authorized. Indeed, the *ATC Order* is clear that the failure to do so requires a <u>reduction</u> in the maximum number of ATC base stations.[62]

In its February 4, 2004 *ex parte*, MSV superficially addresses the issue of how the CDMA MT would implement a power reduction by the use of a half-rate vocoder. MSV states that, as the MT switches to a lower coding rate, it will transmit correspondingly lower power.

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61 *ATC Application* at 13.

62 *ATC Order*, Appendix C2 § 1.14.

This could be the basis of compliance with Section 25.253(a)(2)[63] but it totally fails to address the equally important requirement of Section 25.253(a)(3) which requires that the vacated time slots (in a TDMA scheme) resulting from the vocoder rate reduction remain vacant. There is no obvious way that the requirement of Section 25.253(a)(3) could be applied to a CDMA scheme, and MSV has again failed to propose one, despite being specifically questioned on this point by the Commission.[64] MSV simply has not presented a method to achieve the equivalent interference reduction for CDMA-based ATC.

For the reason discussed above, MSV's *ATC Application* must be dismissed due to MSV's failure to demonstrate compliance with the clearly stated requirements of Sections 25.253(g)(1), 25.253(a)(8), and 25.253(a)(2) and (3).

IV. GRANTING THE REQUESTED WAIVERS AND VARIANCES WOULD INCREASE INTERFERENCE FROM ATC INTO INMARSAT'S MSS SYSTEM

MSV seeks a series of waivers and variances that would result in an ATC system far different than the one contemplated by the Commission's ATC service rules. MSV blithely claims that it can dramatically increase the number of ATC base stations in the U.S., place them closer to airports and waterways, increase the number of ATC mobile terminals ("MTs") deployed, and increase the power levels of its MTs and base stations, and that none of this will adversely impact Inmarsat's MSS operations in the L-band.

On its face, it is farfetched for MSV to suggest that the Commission got everything wrong in establishing the ATC operating limits in the L-band. More fundamentally,

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63 Inmarsat notes that, for both TDMA and CMDA schemes, MSV is not proposing the full 7.4 dB burst EIRP reduction required by § 25.253(a)(2) and is only proposing 3.5 dB reduction. This non-compliance is addressed in detail in Section IV.A.3.

64 *See* Letter from Thomas S. Tycz, FCC, to Bruce D. Jacobs, Counsel to MSV, dated January 21, 2004 (requesting addition information regarding MSV's proposed handsets).

it is clear that grant of MSV's waivers and variances would result in harmful uplink and downlink interference to Inmarsat's MSS network.

A. Uplink Interference Into Inmarsat

MSV's proposed ATC system will cause uplink interference into Inmarsat's satellite in two ways. Interference will occur via the sidelobes of the Inmarsat satellite antennas in the case of the co-frequency channels used by Inmarsat outside of the USA (termed "co-channel" uplink interference herein), and via the main beam of the Inmarsat satellite antennas in the case of the adjacent frequency channels used by Inmarsat within the USA (referred to as "adjacent channel" uplink interference herein). These two interference paths are shown diagrammatically in Figure IV.A-1 below.

The magnitude of the co-channel interference to Inmarsat is directly proportional to the aggregate number of co-frequency ATC MTs and to their individual EIRP levels and transmission characteristics. In order to limit this interference to what the Commission considers an acceptable level, the Commission promulgated the ATC service rules, which govern the design and deployment of the proposed MSV ATC system.[65] The waivers that MSV seeks in its *ATC Application* will significantly increase the co-channel uplink interference to Inmarsat beyond the level that would result from the reference ATC system that the Commission has contemplated.

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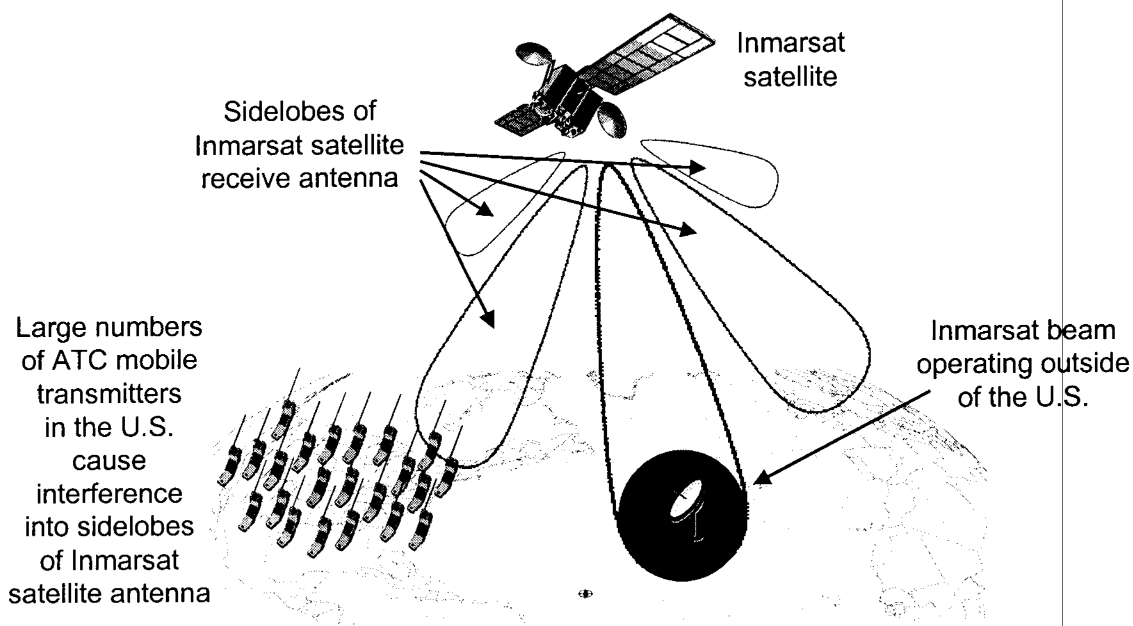
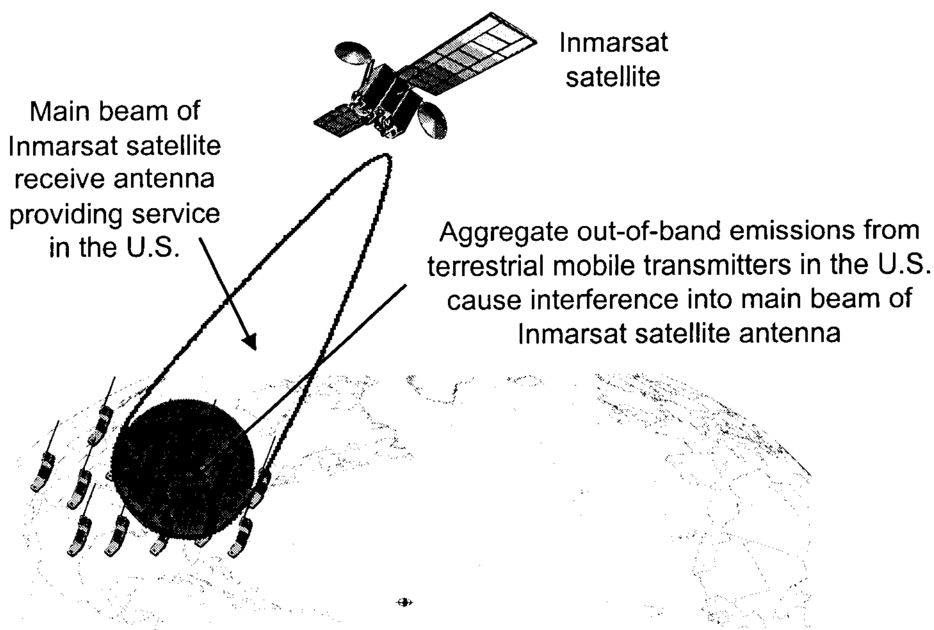
65 *See ATC Order* ¶¶ 128-188.

Figure IV.A-1 - Uplink Interference Mechanisms

(a) Co-Channel Interference



(b) Adjacent Channel Interference



1. <u>A Waiver of the Maximum Number of ATC Base Station Frequency Re-Uses Is Not Warranted</u>

Central to MSV's application is an effort to circumvent the limit that the Commission placed on the maximum number of base stations allowed to operate in the U.S. on any one 200 kHz channel.[66] To this end, MSV cites four interrelated bases in support of its request for a waiver to increase the base station reuse limit from 1,725 to up to 29,571 (*i.e.* 17.14 times greater than the amount permitted under the ATC service rules).[67] These arguments are as follows:

(i) MSV proposes to deploy 80% of its ATC base stations in the U.S. and only 20% in Canada.[68] This factor should have no impact on the application of the ATC service rules, but is one that MSV relies heavily upon;

(ii) MSV relies on the assertion that its MT design has an average 4 dB lower antenna gain (towards the Inmarsat satellites).[69] This is a startling assertion considering there has been no change in the MT antenna design or the peak antenna gain from when the Commission established the ATC rules, based on representations by MSV;

(iii) Most fundamentally, MSV proposes that the Commission require Inmarsat to accept approximately 4.3 times more interference than the Commission deemed appropriate and 6 times more interference than MSV originally represented that its ATC would cause. MSV rationalizes this request by reasserting that Inmarsat should be required to accept 6% $\Delta T/T$ in

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66 *See* 47 C.F.R. § 25.253(c) ("The maximum number of base stations operating in the U.S. on any one 200 kHz channel shall not exceed 1725.").

67 The 17.14 time increase is derived by a combination of the four waivers sought by MSV, as follows:
(i) Ratio of 80% to 50% is 1.6 times;
(ii) 4dB is a linear ratio of 2.5 times;
(iii) Ratio of 6% to 1.4% is 4.2857 times
Combination of all three factors is 1.6 x 2.5 x 4.2857 which is equal to 17.14 times.

68 *See ATC Application* at 12, 17 and n. 27. MSV filed the same narrative in support of each of the cited ATC application proceedings. Therefore, "*ATC Application*" references are applicable all the narratives filed on November 18, 2003 in the cited ATC application proceedings.

69 *See ATC Application* at 12, 18 and Appendix H.

intersystem co-channel uplink interference from a secondary, terrestrial service;[70] and

(iv) MSV claims that its most recent self-interference cancellation scheme would prevent ATC from increasing MSV's noise floor by more than 6% ΔT/T, but in no event would that scheme have any impact on the ATC interference generated into Inmarsat.

As addressed in the sub-sections below, the waivers sought by MSV are unjustified and would result in substantially increased interference into Inmarsat's MSS services. Curiously, while MSV asserts its –4 dB average antenna gain for the first time in its *ATC Application*, the ultimate number of reuses that MSV seeks (29,571) is the same as it sought in its Petition for Partial Reconsideration of the *ATC Order*, using slightly different reasoning. MSV's effort to revise the ATC service rules seems to be driven by a desire to reach a predetermined network size, as opposed to being based on the interference that its operations will generate into MSS operations in the L-band.

Moreover, MSV's request to immediately increase the number of authorized ATC base stations is fundamentally inconsistent with a separate requirement that MSV constrain its ATC deployment to 863 base stations operating on the same 200 kHz channel during its first 18 months of ATC operations.[71] The reasons for phasing in the 1725 base station limit over an initial 18-month phase-in period are to: (i) provide an additional 3 dB of protection to Inmarsat during the initial deployment, (ii) protect safety-related services to ships and aircraft from interference, and (iii) allow Inmarsat time to study the interference impact of ATC in the real world, including the effects of seasonal variations.[72] Moreover, this phase-in period provides Inmarsat the opportunity to object to the interference caused by MSV's untested secondary

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70 *See ATC Application* at 18.

71 *See* 47 C.F.R. § 25.253(b).

72 *ATC Order* ¶ 143.

service, and for MSV to modify its ATC operations, before MSV fully deploys its ATC network.[73] The Commission indicated that it would consider a request to waive its rules "*based on negotiated agreements*"[74] among interested parties in the band. No such agreement exists. Thus, MSV's attempt to increase the number of ATC base stations during the 18-month phase in period is groundless and would undermine the ATC service rules.

a. *Limiting The Deployment of ATC Base Stations In Canada Is Not A Basis for Increasing the Permitted Number of ATC Base Stations in the U.S.*

The ATC Application includes cursory support for the proposition that MSV's commitment to deploy 80% of its ATC base stations in the U.S., and only 20% in Canada, provides a basis for the Commission to waive its rules and increase for MSV the 1725 limit on the permitted number of co-channel ATC reuses.[75] Instead, MSV references the *MSV Petition* in which it argued fallaciously that the Commission calculated a total allowable number of 3450 co-channel ATC base station transmissions and apportioned 50% of them to the U.S. Thus, by MSV promising not to deploy more than 20% of its base stations in Canada, MSV argues that it should be able to increase the 1725 reuse limit to 2760 within the U.S.

MSV misconstrues the Commission's reasoning. At no point in the *ATC Order* does the Commission conclude that a total of 3450 co-frequency ATC base stations is an appropriate limit on the total number of ATC base stations inside and outside the U.S. Such a conclusion would be meaningless as the Commission has no authority to enforce such a limit in Canada, Mexico, or anywhere else outside the U.S. Instead, the Commission determined that a

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73 *ATC Order* ¶ 104 (requiring an ATC operator to resolve harmful interference into an MSS network from ATC base stations or mobile terminals).

74 *Id.* (emphasis supplied).

75 *ATC Application* at n. 27.

limit of 1725 *within the U.S.* is necessary to contain MSV's self-interference and correspondingly would adequately protect Inmarsat co-channel uplinks. The Commission also noted that an additional 1725 co-frequency ATC carriers outside the U.S. could be deployed without appearing to cause undue harm to Inmarsat co-channel uplinks.[76]

The Commission's limit on the number of ATC base stations in the U.S. is rationally based on the assumption of an essentially uniform distribution of ATC MTs across the U.S. The increase sought by MSV through its waiver would result in much higher densities of MTs than contemplated by the Commission and accordingly would result in greater uplink interference into MSV and Inmarsat.

Moreover, the Commission's limits appropriately take into consideration the potential actions of non-U.S. administrations. As the Commission acknowledged, Inmarsat is susceptible to the aggregate effects of ATC uplink interference over a large portion of the Americas.[77] The Commission has no authority to limit the deployment of ATC base stations that are authorized by the regulatory authorities in Canada, Central America, the Caribbean or South America. Even if MSV itself decides not to deploy ATC in non-U.S. locations, other non-U.S. administrations could authorize operators to deploy ATC systems or other secondary applications that would cause uplink interference into Inmarsat's and MSV's MSS systems. If the Commission's rules left no margin for this eventuality, then ATC operations in non-U.S. regions could quickly cause significant uplink interference problems for Inmarsat. The Commission had a rational basis for establishing the limits set forth in the *ATC Order* based on its interference analysis, MSV's representations, and the international considerations inherent in an uplink interference analysis in the L-band. The matter was considered and decided in the

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76 *See ATC Order*, Appendix C2 § 2.1.1.

77 *See ATC Order*, Appendix C2, Figures 1.11A and 1.11B.

rulemaking proceeding. MSV's desire to place a greater percentage of MTs in the U.S. does not constitute a special circumstance that would merit the grant of a waiver. Inmarsat urges the Commission to reject MSV's waiver request.

b. *MSV's Claimed "Average" Antenna Gain Merits No Waiver of the ATC Service Rules*

MSV, in its *ATC Application*, asserts that its MT has a 4 dB lower *average* antenna gain (toward the Inmarsat satellites) than the *peak* gain value that MSV claims was used by the Commission to derive the limits in Section 25.253(c). MSV therefore urges that the limit on co-channel reuses should be increased.[78] MSV's claim, however, is belied by the fact that MSV has made no change whatsoever to its MT antenna design, and that its MT had, and continues to have, a peak gain of at least 0 dBi, and not –4 dBi.[79] Moreover, the relevant factor, under the ATC service rules, is peak MT EIRP, which MSV fails to specify.[80]

When examined closely, MSV offers nothing new that should change the limits calculated by the Commission. The diagrams of MT antenna gain versus angle presented in the MSV Appendix H are of no surprise to anyone with any understanding of antennas of this type.[81] Such small and inexpensive antennas, operated in close proximity to the users' head, will

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78 *See ATC Application* at n. 27 and Appendix H.

79 *See, e.g., ATC Application*, Appendix H at Figures 1 and 4, where the peak gain is +2 dBi in the case of the external stubby antenna, presumably producing a peak EIRP level of +2 dBW (based on an assumed input power level of 0 dBW), which exceeds the limit in Section 25.253(g)(1).

80 *See supra* Section III.A.

81 However, Inmarsat does question the validity of the first two diagrams in Figure 4 of MSV's Appendix H, which claim to be the theoretical performance of the external stubby antenna in the two elevation angle planes. These appear to be very simplistic gain plots that suggest extremely high isolation values for some elevation angles, which are unlikely to be realized in practice. For this reason, we believe that all results in MSV's Appendix H for the external stubby antenna are invalid.

inevitably exhibit large fluctuations in their gain performance.[82] Therefore, despite MSV's latest trigonometric analysis, these results have little meaning in the context of the ATC service rules that apply and with which MSV must comply.

In developing the ATC service rules, the Commission was aware of the statistical effects that create a degree of uncertainty in actual interference levels. For example, the Commission took into account that the maximum MT antenna gain would not always be oriented toward the Inmarsat satellite and accounted for this in the limits it set.[83]

There is no basis for MSV's waiver request, because the Commission has known of MSV's antenna design and specifications from MSV's initial application and the Commission adopted the limits set forth in Section 25.253(c) accordingly. MSV cannot rightfully claim that this issue falls under the "flexibility" caveat in the ATC service rules, because MSV has not proposed any change to the previously assumed ATC MT system design or performance levels, as far as the MT antenna is concerned. Similarly, MSV has made no special showing to demonstrate that its situation is different than that upon which the Commission's rules were based. In fact, the very antenna specifications that MSV points to are the basis for the ATC service rules. MSV has not met its burden to justify the grant of a waiver.

Finally, the Commission's ATC framework is based on interference calculations in which the antenna gain of MSV's MTs are an integral part. To alter these calculations at this point without basis would upset the delicate balance of the Commission's ATC regime. Inmarsat's conclusions on the overall acceptability of the ATC rules regarding uplink

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82 The analyses performed over the past three years in the ATC rulemaking have already taken effects such as head blockage into account. However, MSV's latest statistical analysis does not mention the effect of head blockage on the radiation pattern of the MT antenna, and therefore is likely to be inaccurate.

83 *See, e.g., ATC Order*, Appendix C2 § 1.1, n. 55 (the Commission acknowledges that the MT antenna orientation will be a variable).

interference were based in part on an appreciation of the statistical nature of the ATC interference, including the effects now analyzed by MSV for the first time. To accept this proposal from MSV would have the effect of increasing the interference to Inmarsat by 2.5 times the level established in the ATC service rules. Such an increase is unsubstantiated, and legally unsustainable.

c. *There Is No Basis for Increasing Co-channel Uplink Interference*

MSV seeks to increase the permissible number of ATC base stations by seeking authorization to generate system-wide co-channel ATC interference into Inmarsat's MSS system of up to 6% ΔT/T. It is difficult to understand why MSV believes that a waiver is justified as it raised the very same proposal in the ATC proceeding[84] and the Commission failed to adopt MSV's proposal.[85] Despite the Commission's decision, MSV re-raised the issue in its Petition for Partial Reconsideration[86] and now once again in its *ATC Application*. MSV's request is as unfounded here as it was in the ATC proceeding and is not the legitimate basis for a waiver. *See Industrial Broadcasting v. FCC*, 437 F.2d 680, 683 (D.C. Cir. 1970) (citing *WAIT Radio v. FCC*, 418 F.2d 1153, 1156 (D.C. Cir. 1969). While this issue has been briefed numerous times,[87] for the sake of completeness, Inmarsat addresses it again below.

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84 *See, e.g.,* Letter from MSV to Secretary, FCC, *ex parte* letter, IB Docket No. 01-185 at 1 (filed January 28, 2003); Letter from MSV to Secretary, FCC, *ex parte* letter, IB Docket No. 01-185 at 2 (filed January 24, 2003); Letter from MSV to Secretary, FCC, *ex parte letter*, IB Docket no. 01-185 at 1 (filed January 21, 2003).

85 *See id.*

86 *MSV Petition* at 10.

87 *See, e.g., Inmarsat Opposition* at 8-14, Technical Annex § 2.2.

(1) It Is Inappropriate to Allow ATC To Consume Margin Designed for Intersystem Satellite Coordination

MSV requests an increase in the base station re-use factor of approximately 4.3 times, based on the assertion that the existing re-use factor in the ATC service rules of 1725 would protect Inmarsat to a ΔT/T level of 1.4%, and the assertion that this interference allowance should be increased to 6%. As an initial matter, Inmarsat disagrees with MSV's fundamental premise that the Commission's 1725 reuse limit will result in only a ΔT/T level of 1.4%. In the *ATC Order*, the Commission calculated two ΔT/T values for interference from ATC (from within the U.S.) to Inmarsat-4: (i) in Section 2.1.1 the Commission calculated a ΔT/T of 0.7% and added that if an additional 1725 co-frequency carriers are operated from Canada then the aggregate ΔT/T would be 1.4%; and (ii) in Section 2.1.2 the Commission calculated the figure of 3.4% ΔT/T to Inmarsat. An increase of 4.3 times in the number of co-frequency carriers, as proposed by MSV, would raise the ΔT/T to 14.6%, according to the Commission's calculation in Section 2.1.2 in the *ATC Order*. Such a level is totally unacceptable and far beyond what the Commission contemplated in reaching its decision in the *ATC Order*.

Throughout this proceeding Inmarsat has pointed out the importance of ensuring that ATC interference is kept at a level that is small relative to the interference caused by the satellite component of the MSS/ATC network.[88] Inmarsat has repeatedly demonstrated why ATC deployment should not be allowed to produce more than 1% increased interference into any

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[88] The Commission agrees with this premise, while disagreeing with Inmarsat's proposed 1% ΔT/T limit for ATC. *See ATC Order* at ¶ 164 ("We conclude that as long as the increase in receiver noise from the ATC is significantly less than the increase in noise resulting from the MSS operations, that sharing is feasible, and we disagree with Inmarsat's suggested 1% limit."). Presumably, the Commission bases its disagreement with the 1% limit on the assumption that the acceptable ΔT/T from satellite interference is greater than 6%. However, as explained in the *Inmarsat Opposition*, Technical Annex § 2.2, this is not a realistic assumption.

Inmarsat satellite and that the 6% ΔT/T sought by MSV would cause a serious degradation in the overall performance of the Inmarsat MSS system.[89] Moreover, 1% is the value that MSV originally represented was appropriate[90] and it is a reasonable accommodation for a non-conforming use of the L-band for a secondary terrestrial service.

The limits set forth in the ATC service rules would enable Inmarsat to coordinate its satellite network with MSV and other operators without having to make significant allowance for the interference contribution from ATC. This ensures that there is no loss of spectrum efficiency for the MSS systems operating in the L-band. If the number of permitted co-frequency ATC reuses is increased, as proposed by MSV, this situation will change dramatically. If the interference from ATC were allowed to reach similar levels to the interference from the satellite component, ATC interference effects could no longer be ignored in satellite coordination and the frequency reuse between satellite systems would be degraded.

It is important to remember that MSV's proposed ATC operation is a secondary service in a band designated for international MSS service. Inmarsat is subject to interference from an increasing number of satellite systems, including but not limited to MSV's satellite operations, and it must plan its operations accordingly. Allowing a secondary service to be a

89 *See, e.g.,* Letter from Inmarsat to Secretary, FCC, *ex parte presentation entitled "Terrestrial Use of the L-Band"*, IB Docket No. 01-185 at 17 (filed November 5, 2002); Letter from Inmarsat to Secretary, FCC, *ex parte letter*, IB Docket No. 01-185 at 2-3 (filed January 10, 2003); Letter from Inmarsat to Secretary, FCC, *ex parte letter*, IB Docket No. 01-185 at 1-2 (January 23, 2003).

90 *See, e.g.,* MSV Presentation, *ex parte* presentation at Ex. A, IB Docket No. 01-185 (January 13, 2003); MSV Presentation, *ex parte* presentation at 5, IB Docket No. 01-185 (February 5, 2002).

significant contributor to the interference with which Inmarsat must contend is inappropriate and would result in a serious degradation in the overall performance of Inmarsat's MSS system.[91]

Consistent with ITU Recommendations, Inmarsat generally allows for about a 25% increase in its noise floor due to interference from all external interference sources. As to any single satellite network, Inmarsat uses a 6% increase in noise as the basis for satellite coordination.[92] This is the internationally accepted standard for the coordination of (co-primary) satellite system generated interference -- not interference from a secondary service. To allow ATC to create a 6% ΔT/T into Inmarsat's satellites would mean that a non-conforming use would consume approximately 25% of Inmarsat's total interference budget. Moreover, if Canada or Mexico were to allow a similar ATC regime, even more of Inmarsat's interference budget – which should be used for coordinating intersystem satellite interference – would need to be designated for ATC coordination. This is not a theoretical concern – MSV has been advocating for Industry Canada to authorize ATC.

The number of satellites operating in the L-band is increasing and a reasonable amount of interference must be allotted to each interferer for satellite coordination. This must take priority over allocating interference for a secondary service. As the Commission has made clear, the ATC service rules are designed to "ensure that MSS remains first and foremost a

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91 Although never submitted in the ATC proceeding, MSV cites to the COMTEK Association Inc. study. *ATC Application*, Appendix I n. 3. Inmarsat has already explained why the study was wrong when it asserted that Inmarsat should be able to accept a 13.7% ΔT/T thermal noise degradation. *See* Letter from Inmarsat to Secretary, FCC, regarding COMTEK Report, *ex parte* presentation of Inmarsat, IB Docket No. 01-185 (filed December 19, 2002).

92 *See, e.g.,* Recommendation ITU-R M.1183. Only in extraordinary cases have exceptions been made to enable increased satellite reuse of spectrum, and then only after a detailed analysis. *See Inmarsat Opposition*, Technical Annex § 2.2.

satellite service."[93] The Commission never intended MSS operators to trade the capacity and quality of their satellite operations for a larger terrestrial service and should not grant a waiver that effectively does just that.

(2) MSV's Theoretical Self-interference Cancellation Scheme Does Not Justify a Waiver

(a) MSV's Interference-Cancellation Technique Does Not Protect Inmarsat

MSV bases its request to increase the number of ATC base stations on a proposed "self-interference cancellation" scheme. This proposal threatens a fundamental tenet of the ATC service rules: that regulating the level of interference into MSV's spacecraft is the primary means of constraining the impact of ATC interference into Inmarsat. It also threatens to transform MSV's ATC service offering from an ancillary service into MSV's primary use of the L-band.

In adopting a limit of 1725 ATC base stations per 200 kHz channel, the Commission was very clear that it was seeking to constrain MSV self-interference to 0.25 dB, and derivatively, "limit potential for interference to other co-frequency MSS operators."[94] Indeed, as noted above, one the reason for phasing in this 1725 base station limit – allowing MSV to operate only 50% of its permitted base stations during an initial 18-month phase-in period – was to provide an additional 3 dB of protection to Inmarsat during the initial deployment. The phase-in period allows Inmarsat time to analyze the interference impact of ATC in the real world, and if necessary, object to the interference caused by MSV's secondary service.

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93 *ATC Order* at ¶ 3.

94 *ATC Order* at ¶ 145 and Appendix C2 § 1.14; *see generally ATC Order* at ¶¶ 138-147.

DC\665945.1

However, MSV ignores this fundamental purpose of the base station limits when it advocates its new self-interference cancellation technique. Nowhere does MSV even begin to suggest how MSV's ability to manage ATC interference at MSV's spacecraft helps to constrain the level of interference its ATC mobile terminals generate toward the Inmarsat spacecraft. Nor can MSV even hope to do so. This failure to even attempt to explain how increasing the number of ATC base stations is consistent with the need to protect Inmarsat from interference, and the rule which requires that ATC be phased in over an 18-month period, renders unsustainable MSV's request for a waiver of the ATC base station limit.

(b) MSV's Proposed Self-interference Technique Would Be Costly, Spectrally Inefficient and Totally Impractical To Implement

MSV's self-interference cancellation technique appears to be nothing more than a clever way to hide the fact that MSV's ATC service will cannibalize its MSS service, and increase MSV's demand for L-band spectrum.

At the outset, it is important to recognize that, throughout the entire rulemaking process, MSV proffered no "self-interference cancellation scheme." Only in its Petition for Partial Reconsideration did MSV, for the first time, introduce the prospect of a self-interference cancellation scheme for its ATC system.[95] In the *MSV Petition*, MSV claimed a patent application had been filed for a technique to use two in-orbit MSV satellites to give space diversity and thereby decrease self-interference. Inmarsat responded at that time, highlighting the technical difficulties and high cost of such a scheme.[96] Realizing the inadequacies of its first idea, MSV proposes a totally new concept for self-interference cancellation in its *ATC Application*.

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95 *See MSV Petition* at 11.

96 *See Inmarsat Opposition*, Technical Annex § 2.2(b).

MSV's new cancellation scheme, however, is no more practical than its last one. As discussed in Appendix A, attached hereto, MSV's plan may be theoretically pleasing, but is a nightmare in reality. MSV has not even begun to describe how it would practically implement the scheme. The reason may be that MSV simply does not have any solutions to the complexities of trying to make the scheme work. MSV would be required to increase the number of channels in its next generation satellite by a factor of seven, with a huge impact on the complexity of the satellite communications payload. Moreover, MSV would require seven times as much feeder link spectrum to operate its self-interference cancellation plan as described. Finally, the number of interference cancellers required to effectively cancel interference would be far greater than implied in MSV's application. The increase in channels, feeder link spectrum requirements, and the number of interference cancellers would dramatically increase the complexity and cost of MSV's next generation system. In addition, the feeder link spectrum needed by MSV to implement its plan would exceed by far the internationally allocated FSS spectrum in the 13/11 GHz bands, and would simply not be available at the designated MSV orbital locations.

For MSV's current generation satellite system, the implications are even worse. Because it is impossible to increase the capacity and feeder link frequency range in the MSV in-orbit satellite, the effect of implementing the proposed scheme would be that only 1/7 of the MSV satellite capacity would be available for MSV to carry MSS traffic - the rest would have to be dedicated to interference monitoring. This would effectively eliminate MSV's MSS service. The only conclusion that can be drawn is that MSV's self-interference cancellation plan is completely impractical from a cost, engineering and spectrum availability perspective.

If the MSV self-interference cancellation technique fails to live up to its billing – as Inmarsat has demonstrated that it will – then MSV's MSS service will suffer significantly.

MSV will be left in a position where (i) MSV's customers will receive a poor MSS service or (ii) MSV will seek additional L-band spectrum to compensate for ATC generated self-interference.

Both results are antithetical to the *ATC Order*. The Commission has made clear that MSS must remain "first and foremost a satellite service"[97] and ATC should be "ancillary" to a fully operational space-based MSS system.[98] Allowing ATC operations to degrade the quality of MSV's MSS service should not be allowed. Moreover, the Commission clearly has stated that deployment of ATC cannot be used to justify a larger MSS satellite spectrum assignment under the Mexico City MOU.[99] Seeking additional spectrum allocation to compensate for self-interference from ATC is a "backdoor" method of obtaining L-band spectrum for ATC use and should not be countenanced.

2. <u>No Waiver of the 18 dB Structural Attenuation Margin is Warranted</u>

As noted above, the Commission must dismiss MSV's application as deficient because MSV has failed to comply with a clear requirement that it include a "demonstration that the cellular structure of the ATC network design includes 18 dB of link margin allocated to structural attenuation." For the following reasons, compliance with this rule is essential to the overall ATC licensing scheme in the L-band.

Section 25.253(a)(8) embodies a critical technical assumption underlying the Commission's conclusion that co-channel uplink interference from ATC use of the L-band can be controlled to a manageable level. This assumption is that the maximum EIRP level from all ATC mobile terminals will be controlled, so that the interfering signal level received at the Inmarsat satellite from each ATC mobile terminal essentially will be the same, regardless of

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97 *See ATC Order* at ¶ 3.

98 *See ATC Order* at ¶ 67.

99 *See ATC Order* at ¶ 251.

whether the ATC terminal is operated inside or outside a building. Without the constraint on ATC system design reflected in this rule, ATC use of the L-band would have to be greatly constrained---under the Commission's own calculations, the 1725 ATC frequency reuse factor currently in the rules would have to be reduced to possibly as low as 27.[100]

Section 25.253(a)(8) mandates that an L-band ATC system must be designed with at least an 18 dB link margin *allocated to structural attenuation*.[101] Essentially, this means that an ATC mobile terminal must significantly reduce its power whenever the mobile terminal is not inside a building. Specifically, the signal strength of all transmitting ATC mobile terminals that operate at the maximum permitted EIRP level (0 dBW) must be attenuated by at least 18 dB in the direction of the Inmarsat satellite due to building penetration, and any mobile terminal operating with a clear line of sight to the Inmarsat satellite must be limited to a maximum EIRP level of -18 dBW. This rule obligates the L-band ATC applicant to demonstrate how it will comply with these operating conditions to ensure that its ATC system does not exceed the interference level assumed in the Commission's analysis.[102]

In its Petition for Reconsideration and Clarification, Inmarsat explained that it had certain issues with respect to this requirement. Namely, Inmarsat urged that the Commission

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100 $1725/10^{1.8} = 27$.

101 *See supra* note 53.

102 There is a typographical error in paragraph 142 of the Order, which Inmarsat has requested be corrected. In that paragraph, the Commission references a 10 dB (versus an 18 dB) margin when discussing the required link margin for power control that is to be used solely for overcoming structural attenuation. At numerous points in the text and supporting analysis, *see, e.g., ATC Order* at Appendix C2 §§ 1.2 and Table 1.14.A, the Commission states that it relies upon a structural attenuation of 18 dB to justify the interference limits it establishes in the new ATC service rules. *See ATC Order* ¶ 140. Thus, it is clear that the Commission assumes and relies upon a link margin of 18 dB to support the interference analysis upon which its rules are based. It is only in paragraph 142 that a link margin of "10 dB" is used with reference to structural attenuation.

recognize that a mobile terminal seeking to communicate with a base station typically cannot distinguish between (i) the need to increase power because a user is standing inside a building, (ii) the need to increase power because the user is outside the edge of an ATC coverage cell (far from an ATC base station), and (iii) the need to increase power because the path between the user and the ATC base station is blocked by a building or other obstacle.[103] An 18 dB link margin intended for indoor structural attenuation that is actually used by ATC mobile terminals to overcome signal attenuation while a user is outdoors therefore would present a significantly greater interference threat to Inmarsat spacecraft than contemplated by the ATC service rules.

Specifically, a building may block the signal to an ATC base station, from a mobile ATC terminal being used on a street corner, causing the mobile terminal to increase transmit power in order to close the link. The same mobile terminal also may have a clear line of sight to an Inmarsat satellite. Thus, in order to make a call, the ATC terminal (which cannot tell whether it is inside or outside) may automatically increase transmit power both in the direction of the ATC base station, and also in the direction of the Inmarsat satellite. Thus, there is a clear need for an ATC system designer to ensure that the 18 dB link margin specified in Section 25.253(a)(8) is used solely to overcome structural attenuation while the mobile terminal is operated indoors. Otherwise, the ATC system may not adequately control the level of interference into L-band spacecraft.

Moreover, it is common practice for cellular and PCS networks to be planned with little margin at the edge of a cell, to allow an operator to cover the largest possible geographic area with the fewest base stations. Thus, absent an express constraint to the contrary, it is rational to expect an ATC network to allow mobile terminals to increase power levels to

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103 *See Inmarsat Petition* at 8-9.

complete a call when located outdoors at the edge of a cell in the ATC network.[104] Doing so in the ATC context not only would be economically rational, but also fully consistent with practice in the mobile terrestrial communications industry. An ATC operator also has the incentive to cover as much geographic area as possible with the fewest base stations (and hence operate with little margin at the edge of cells) because of the limit on the total number of permitted ATC base stations. However, such a practice also would increase the uplink interference into the Inmarsat spacecraft far beyond the level that is assumed under the Commission's analysis and reflected in the ATC service rules.

Thus, in its Petition for Reconsideration and Clarification, Inmarsat urged that the Commission ensure that an ATC applicant not use its link margin for the wrong purpose. MSV responded to these issues by providing vague assurances that there are possible ways to address such problems, such as design techniques involving sharp signal cut-off at the edge of the service area.[105] However, MSV did not address the concern of the outdoor ATC mobile operating at full power because it happens to be blocked from its base station. MSV asserted that Inmarsat's technical concerns were "merely speculative" and could be addressed in the context of a specific ATC application, where Inmarsat could address the deficiencies of any such application.

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104 To address this issue, Commission adopted an express requirement that "MSS licensees shall not extend the coverage area of any ATC cell beyond the point where an ATC MT could operate at the edge of coverage of the ATC cell with a maximum EIRP of –10 dBW." *ATC Order* at ¶ 142. Inmarsat has requested two clarifications of this requirement. First, to be consistent with the 18 dB link margin requirement discussed above, it is clear that the Commission intended the maximum EIRP at the edge of a cell to be –18 dBW, rather than –10 dBW. Second, this very specific requirement about not extending edge of cell coverage should be codified in the ATC service rules. *Inmarsat Petition* at 7-10.

105 *See MSV Opposition* at 4-5 and Appendix A.

That time has now come. Yet, as detailed above, MSV once again fails again to explain precisely how it will design its system to ensure compliance with Section 25.253(a)(8). MSV provides no basis for waiving this requirement.

3. No Waiver Should Be Granted For The Use of Half-Rate Vocoders

In its *ATC Application*, MSV proposes not to comply with Sections 25.253(a)(2) and (3) which dictate the use of a quarter-rate vocoder that meets a particular transmit duty cycle as a function of the required peak EIRP level.[106] MSV intends to use only a half-rate vocoder with a threshold peak EIRP level of –3.5 dBW.[107] MSV raised this same argument in its Petition for Partial Reconsideration.[108] It appears that MSV has either misunderstood the Commission's rationale for the requirements in Sections 25.253(a)(2) and (3) or is deliberately attempting to confound the issue.

In the *ATC Order*, the Commission required a quarter-rate vocoder that would have the effect of limiting the maximum EIRP that an MT can transmit to –7.4 dBW, when averaged over several frames of the TDMA waveform. The effective power reduction is achieved by forcing the MT to reduce the duty cycle of the TDMA bursts in accordance with a given schedule to achieve an effective average power reduction. The Commission then further explained that the use of such an MT design, with the user distribution proposed by Dr. Vogel in an earlier MSV pleading, would produce an average uplink interference reduction over the universe of MTs of 3.5 dB.

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106 *ATC Application* at 13.

107 MSV made this same proposal in its Petition for Partial Reconsideration. *See MSV Petition* at 14.

108 *See MSV Petition* at 14; cf. *Inmarsat Opposition* at 15 and Opposition Technical Annex § 3.

MSV proposes to ignore the clear requirement for an effective EIRP limit of –7.4 dBW (due to the use of time averaging using a quarter-rate vocoder) and instead offers only an EIRP limit of –3.5 dBW, which is almost 4 dB higher than the maximum EIRP level mandated by the Commission. MSV claims that this would give the same interference reduction of 3.5 dB that the Commission assumed. MSV fails to note, however, that the 3.5 dB assumed by the Commission is the result of the ensemble of MT's operating according to Dr. Vogel's user distribution pattern.[109] If the vocoder proposed by MSV is analyzed using the Vogel user distribution pattern, the resulting average reduction in uplink interference will be only between 0.97 and 1.87 dB, as shown in the table below, compared to the 3.5 dB reduction required in the Commission's analysis. This table replicates the analysis in Table 1.10.B of Appendix C2 of the *ATC Order*.

User Location	Percent Population (%)	Duty Cycle (%)	Weighted Duty Cycle
Outdoor	30	100	0.30
In Car	30	50/100	0.15/0.30
In Building	40	50	0.20
		Sum =	0.65/0.80
		Average Vocoder Power Reduction (dB) =	**-1.87/-0.97**

Properly analyzed, the Commission's determination that a quarter-rate vocoder is necessary to ensure the proper interference reduction is correct. MSV's waiver request therefore should be denied.

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109 The 3.5 dB interference reduction assumed by the Commission is based solely on the reduction in average EIRP due to the duty cycle of the mobile terminal. Other effects are taken into account by the Commission through other factors included in the interference analysis, in particular the power control factor of 20 dB. Hence, the fact that the Commission rule effectively limits the average EIRP to –7.4 dBW does not mean that the vocoder factor should be 7.4 dB. Similarly, MSV has made the mistake of assuming that because their proposed vocoder schedule limits the average EIRP to –3.5 dBW, it achieves the interference reduction assumed by the Commission. It does not.

4. MSV's Waiver Requests for Unlimited Frequency Re-Use in Non-Co-Channel Shared Frequencies and Elimination of the 90,000 MT Peak Gain Limit Should Be Denied

Two of MSV's "waiver" requests advocate positions that the Commission previously considered in a rulemaking context and squarely rejected in the ATC Order: (i) MSV's request for "unlimited reuse" of L-band frequencies that MSV does not share co-channel with other L-band satellite operators,[110] and (ii) MSV's request to eliminate the 90,000 mobile terminal "peak traffic" limit on its ATC system.[111]

As noted above, the courts are clear that MSV bears a heavy burden to demonstrate that its waiver arguments are substantially different from those which have been carefully considered in the rulemaking proceeding.[112] Under any circumstances, MSV must identify specific facts that distinguish it from other parties subject to the rule.[113] MSV fails on both points.

As an initial matter, MSV cannot even conceivably meet the threshold for a waiver, because the rules from which it seeks relief have been adopted to address the specific circumstances that apply to MSV itself. Stated another way, these limits were imposed to address the interference threat posed by the very ATC architecture that MSV proposed, and are consistent with the very limits that MSV represented in its repeated technical analyses throughout the proceeding.[114] Indeed, these very limits were fully debated on the record between

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110 *ATC Application* at 16-17 and Appendix G.

111 *ATC Application* at 24-25.

112 *Industrial Broadcasting v. FCC*, 437 F.2d 680, 683 (D.C. Cir. 1970) (citing *WAIT Radio v. FCC*, 418 F.2d 1153, 1156 (D.C. Cir. 1969).

113 *See International Union of Painters & Allied Trades v. NLRB*, 309 F.3d 1, 5 (D.C. Cir. 2002).

114 *See, e.g., ATC Order*, Appendix C2 § 1.14; *February 5, 2002 MSV Presentation* at 22.

MSV and Inmarsat in a series of ex parte presentations in January 2003, up to the end of the rulemaking proceeding.

Moreover, MSV simply fails to address the core reasons the Commission articulated for rejecting MSV's pleas for unlimited ATC operations and for imposing these restrictions that MSV now wants waived. The Commission clearly heard MSV's prior plea:

> MSV urges the Commission to minimize the restrictions on its planned ATC network deployment to the extent possible where its operations are not co-channel with another MSS system's operations. They argue that such situations require no restrictions . . . .[115]

The Commission squarely rejected this proposal, based on the need to constrain the scope of MSV's ATC operations. Specifically, the Commission rejected the proposal for unlimited use of non-co-channel operations based on the need to constrain self-interference into the MSV spacecraft, as well as limit the potential for interference into other MSS operators:

> We find this restriction is necessary because we are not convinced, based on the record, that MSV can accurately and repeatedly measure this low level of interference at their satellite and we believe that this limitation on MSV's satellite noise increase will provide for MSS ancillary terrestrial service and limit the potential for interference to other co-frequency MSS operators.[116]

Furthermore, the Commission declined to allow unlimited uses of bands that may not be shared on a co-channel basis today, because frequency sharing among MSS systems in the L-band is subject to continued change, and failing to the impose limits on MSV could embroil the Commission in a longstanding international coordination dispute under the Mexico City MOU:

> At this time, it is unclear which channels will be occupied by which MSS operator in the future because the MOU frequency arrangement is not static. Even in a static environment, parties do not always agree on the precise types of operations that constitute co-channel interference. In a dynamic environment, such as L-band

115 *ATC Order* ¶ 145.

116 *Id.*

MSS, we are concerned that determining the co-channel interference that arises from fluctuating and geographically discrete operations might require our continued oversight over many years with no foreseeable end.[117]

Section 1.14 of Appendix C2 to the *ATC Order* further makes clear that the Commission considered the 90,000 mobile terminal peak loading limit as one that is integrally related to the 1725 base station carrier limit that was adopted with a view toward constraining MSV self-interference, thereby keeping ATC ancillary, as well as protecting other MSS systems. In this regard, it is important to recognize that the 90,000 terminal limit is not something the Commission made up out of whole cloth. Rather, it has its genesis in the repeated representations that MSV made to the Commission.[118] As that Appendix explains, MSV's various analyses assumed a maximum peak traffic limit of 90,000 terminals, based on a maximum of 2000 mobile terminals transmitting on a single channel. Considering that the Commission allowed MSV to simultaneously operate only 1725 mobile terminals on a single channel, the 90,000 terminal peak traffic limit that it ultimately adopted is certainly within the scope of the limits that MSV's own analysis contemplated.

In sum, for all of these reasons, the Commission concluded: "[W]e decline to adopt rules that would relax interference protections to other MSS licensees based on MSV's assumption that the number of co- and adjacent-channel operations in the L-band is limited."[119] Similarly, there is no basis for the relief that MSV seeks in its renewed appeal for a waiver.

B. Downlink Interference Into Inmarsat

MSV also seeks a relaxation of several rules that the Commission adopted to protect Inmarsat's mobile earth terminals ("METs") from interference generated by ATC base

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117 *ATC Order* ¶ 146.

118 *See, e.g., February 5, 2002 MSV Presentation* at 22.

119 *ATC Order* ¶ 147.

stations. MSV's waiver requests are based on the assumption that Inmarsat's METs are much less sensitive to interference than they are in reality. Inmarsat responded to these same arguments in MSV's Petition for Partial Reconsideration[120] and provided detailed reports from the manufacturers of Inmarsat's METs explaining why the terminals were in fact more sensitive to interference than is reflected in the Commission's analysis.[121] Instead of relaxing the protections afforded Inmarsat's METs, Inmarsat has requested in its Petition for Reconsideration that the Commission recalculate the rules protecting Inmarsat METs operating near airports, harbors and waterways, based on Inmarsat's demonstration that the actual overload thresholds for Inmarsat METs are lower than the values used by the Commission in drafting the existing rules.[122] For the sake of completeness, Inmarsat addresses MSV's arguments once more and elaborates on why the Commission's calculations underestimate the sensitivity of Inmarsat's METs.

All parties recognize that MSV's proposed ATC base stations will cause downlink interference into Inmarsat's METs. The problem is created by the fact that the ATC base stations are much closer to the Inmarsat METs than is the intended Inmarsat satellite, as shown in Figure IV.B-1 below.

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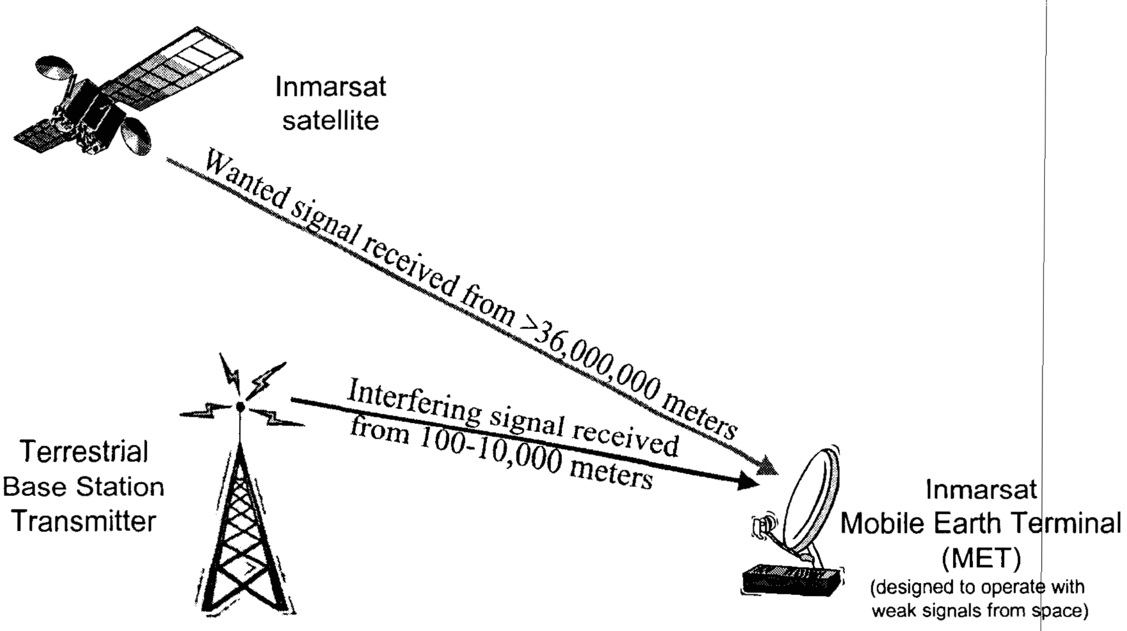
120 *See Inmarsat Opposition* at 15-18 and Technical Annex § 5.

121 The NERA report and the Honeywell letter, which analyze the sensitively of Inmarsat's METs and are discussed below, are attached hereto as Appendices B and C.

122 *See Inmarsat Petition* at 15-17.

Figure IV.B-1 - Downlink Interference Mechanism



This interference mechanism manifests itself in two different ways:

(a) Overload. The high power signal from the ATC base station is not within the intended receive band of the Inmarsat MET, but it nevertheless degrades the MET receiver, due to nonlinear effects within the MET receiver, in the following ways:

(i) High power ATC signals outside of the receive band of the Inmarsat MET produce intermodulation products within the front-end of the Inmarsat MET receiver. These intermodulation products can fall within the intended receive band of the Inmarsat MET, producing an interfering signal comparable to the intended low-level signal being received by the Inmarsat MET.[123]

(ii) High power ATC signals outside of the receive band of the Inmarsat MET can also overdrive the active amplifiers in the front end and/or subsequent portions of the Inmarsat MET receiver such that their gain is reduced and they no longer perform correctly for the intended signal. This effect is often referred to as "small signal suppression."[124] This effect generally occurs for ATC signal levels significantly higher than that required to

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123 Two or more interfering ATC base station carriers will produce odd-order (e.g., 3^{rd}, 5^{th}, 7^{th} etc) intermodulation products that fall in adjacent or nearby frequency bands. Therefore, ATC carriers transmitted in spectrum not used by Inmarsat in the U.S., will produce intermodulation products that fall directly on the Inmarsat downlink carriers.

124 This small signal suppression is effectively the mechanism referred to by the MSV tests.

cause the intermodulation products described in (i) above, except when the interfering signal is close in frequency (*e.g.*, within 300 kHz to 1 MHz) to the wanted signal received by the Inmarsat terminal, when comparable single carrier levels cause the receiver to fail to operate correctly.[125]

(b) ATC Out-of-Band Emissions. The ATC base stations will also radiate unwanted out-of-band emissions that fall directly within the receive band of the Inmarsat MET receivers, thereby causing interference to the Inmarsat downlinks.

From the detailed analyses performed by the Commission, Inmarsat and MSV over the past three years, it is apparent that the "overload" effects (item (a) above) are more critical in terms of harmful interference into Inmarsat than the "ATC out-of-band emissions" effects (item (b) above). However, MSV has never addressed item (a)(i) above, which is the most critical of all, and instead has only considered item (a)(ii), and then only partially as discussed below. Because MSV has totally ignored these real world effects, all of MSV's analyses of downlink interference into Inmarsat's METs are seriously flawed, and so MSV's waiver requests seeking the relaxation of the ATC service rules, insofar as they affect the downlink interference, are unsubstantiated and must be denied.

1. The Commission Should Deny MSV's Waiver Request to Increase the Limit on Aggregate EIRP from ATC Base Stations

MSV seeks a waiver of Section 25.253(d)(1)[126] that would (i) increase the aggregate EIRP per sector by 15 dB and (ii) specify an aggregate EIRP per sector rather than an EIRP per carrier and an associated maximum number of carriers.[127] MSV also proposes to introduce a new aggregate limit for all base stations within a 50 mile radius of 58.3 dBW in any given direction. Inmarsat is not opposed to item (ii), provided that the aggregate power level

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125 *See* Appendices B and C.

126 "Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall not: (1) exceed peak EIRP of 19.1 dBW, in 200 kHz, per carrier with no more than three carriers per sector;" 47 C.F.R. § 25.253(d)(1).

127 *See ATC Application* at 20-21; cf. 47 C.F.R. § 25.253(d)(1) and (2).

arriving at the Inmarsat MET is not affected.[128] Inmarsat, however, is strongly opposed to item (i), because it would increase the already harmful interference levels by a further 15 dB and thereby significantly increase the exclusion zones where Inmarsat METs will be unable to operate reliably, if at all. Inmarsat also is opposed to the proposed waiver to allow an aggregate EIRP limit value (within a 50 mile radius) of 58.3 dBW, as explained further below.

The current base station EIRP limit in § 25.253(d)(1) is based upon the values repeatedly proposed by MSV in its pleadings dating from March 2001 (MSV's original ATC application) through July 2003. Only in its Petition for Partial Reconsideration did MSV introduce, for the first time, the proposal to increase the base station EIRP limit by 15 dB. This was based solely on MSV asserting that Inmarsat's METs would tolerate –45 dBm before harmful interference would occur, despite the overwhelming evidence to the contrary provided by Inmarsat.[129]

a. *Inmarsat's METs Are 15 dB More Sensitive Than the Commission Calculated*

In the *ATC Order,* the Commission assumed an overload threshold for Inmarsat mobile receivers of –60 dBm. Inmarsat, however, provided two reports from two separate Inmarsat receiver manufacturers (NERA and Honeywell),[130] which demonstrate that a threshold value of at most –75 dBm is necessary to protect Inmarsat receivers from interference due to

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128 The implementation of MSV's proposed item (ii) would be to make a new aggregate EIRP limit per base station sector of 23.9 dBW (i.e., 19.1 + 10log(3)).

129 *See* Appendices B and C; *Inmarsat Petition* at 15-17; *Inmarsat Opposition* at 15-17, Technical Annex § 4.

130 *See* Appendices B and C.

nonlinear effects, including small signal suppression and intermodulation product interference, arising from out-of-band signals transmitted by the proposed ATC base stations.[131]

NERA concludes that an appropriate overload threshold is around –75 dBm, which is 15 dB lower than the threshold assumed by the Commission. Based on the existing RTCA and ARINC standards, Honeywell explains that (i) the overload threshold for aeronautical terminals is –72 dBm at 1 MHz frequency offset, and (ii) for offsets less than 1 MHz, no specifications currently exist but the overload level is actually lower. Using this –72 dBm value in the Commission's analysis yields a 12 dB link margin deficit instead of a 10 dB positive margin.[132] The threshold level determined by the manufacturers indicates that Inmarsat METs are significantly more sensitive than the Commission accounted for in its calculation of ATC base station EIRP limits. The lower overload thresholds demonstrated by these manufacturers affect the interference susceptibility of all Inmarsat terminals, regardless of whether they are operated near an airport, on an aircraft in flight, in a harbor, on a waterway, or on land. Thus, even at the limits established by the Commission, the Inmarsat METs could suffer significant interference problems from the deployment of ATC base stations, thereby degrading Inmarsat's MSS service.

b. *MSV's Analysis of Inmarsat's METs Ignores Intermodulation Interference and Considers only Part of the Inmarsat MET Receiver Chain*

In the *ATC Application*, MSV again asserts that the appropriate threshold value for out-of-band interference is –45 dBm. MSV's assessment is based the measurement of the nonlinear transfer characteristic, in particular the 1 dB compression point (which is related to, but

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[131] See *Inmarsat Petition* at 15-17 and *Inmarsat Opposition* at 16.

[132] *See* Appendix B at 2; *cf. Order* at Appendix C2, Table 2.2.3.2.A.

not identical to, the small signal suppression effects) in the Inmarsat METs.[133] It totally ignores the harmful interference to the METs caused by intermodulation product interference in the METs and also fails to even attempt to relate the 1 dB compression point levels to small signal suppression effects.

MSV's latest assertion regarding the appropriate threshold level is based solely on the measurement of the 1 dB compression point of various Inmarsat receivers. This is not a satisfactory way of assessing the interference that can result from adjacent channel signals due to the nonlinearity of the Inmarsat receivers. The 1 dB compression point is a measure of the departure from linear performance, but it does **not** indicate the level below which no interference occurs. In particular, interference due to 3rd order intermodulation products generated by the nonlinearity of the Inmarsat receiver, either by the front-end amplifier or by the first mixer, will occur at input levels significantly below the 1 dB compression point. For this reason the MSV results, which only take account of the 1 dB compression point, are meaningless in this assessment of adjacent channel interference.

MSV's test method is based on measuring the 1 dB compression point between the input and output of the NERA mini-M Worldphone Antenna/RF unit by applying a single high-powered signal and measuring the output at an intermediate frequency (IF). This method is invalid because it:

- ignores the effect an interfering signal will have on the demodulation of a wanted signal;
- ignores the generation of harmonic signals and the resulting intermodulation effects created by non-linearities when applying more than just one signal at the receiver input;
- ignores the degradation effects that will be suffered by the elements that are further down the receiver chain such as A/D converter, amplifiers, downconverters and filters; and

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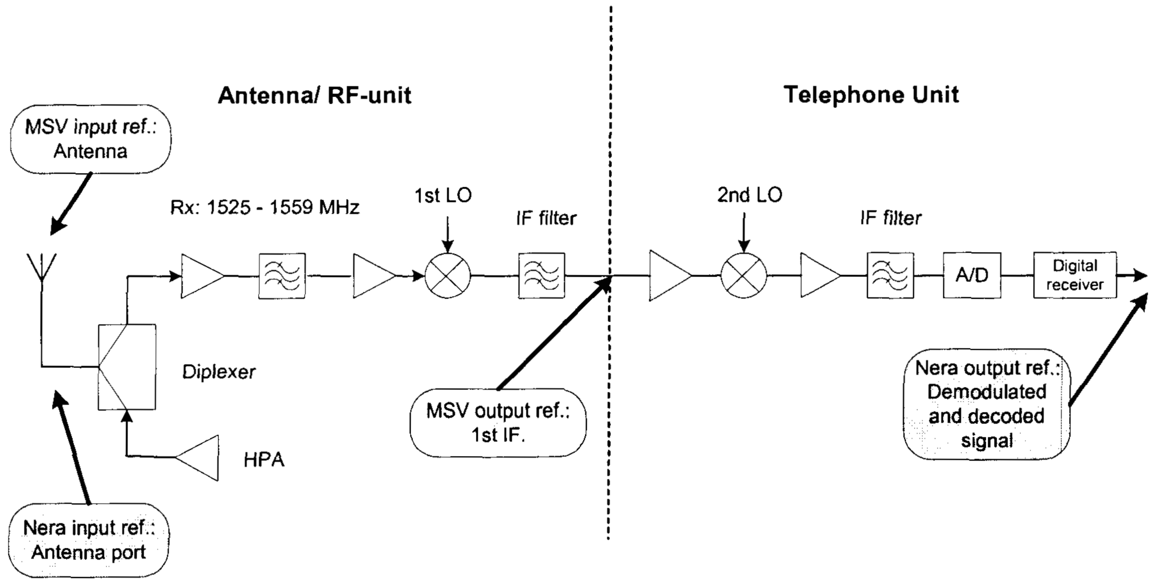
133 *See ATC Application* at Appendix J.

- ignores the increased composite power level applied to the A/D converter.

The shortcoming of MSV's test method becomes apparent when considering NERA's actual mini-M receiver architecture (see Figure below) which is separated into an Antenna/RF unit and a Telephony (or modem) unit with an IF-interface in between.



As can be seen from the figure, there are a number of important and sensitive receiver elements after the IF which MSV has not taken into account. All the receiver elements to the right of the dotted vertical line are effectively left untested by MSV's test method.

Design engineers at NERA have indicated to Inmarsat that saturation of the A/D converter as well as intermodulation products created in the second downconverter are likely to be the most interference sensitive elements in their Worldphone receiver chain.

To conclude, MSV's method is completely inappropriate to benchmark actual effects of interferer degradation on demodulated signals. To make such a benchmarking appropriately one needs, as a minimum, to consider

- the whole receiver chain, not just selective parts of it;
- the effect of intermodulation caused by receiver non-linearities; and
- the effect of power overload at the A/D converter input.

The GAN tests carried out by NERA[134] take these factors into account, and thereby gives a "real-world" benchmarking of receiver sensitivity. Therefore, contrary to MSV's request, the logical result from Inmarsat's data is that the current limit in § 25.253(d)(1) should in fact be reduced by 15 dB, rather than increased by 15 dB as MSV proposes. As a result of the above, Inmarsat urges that the Commission deny MSV's waiver request and proposes that MSV comply with an aggregate EIRP limit per base station sector of 8.9 dBW, and not 38.9 dBW as proposed by MSV.

2. MSV's Waiver Request For an Aggregate EIRP Limit Within a 50 Mile Radius Should Be Denied

Regarding MSV's proposal to limit the aggregate EIRP limit from all ATC base stations within a 50 mile radius, this is not adequate to protect aeronautical Inmarsat terminals. MSV first introduced this proposal in its Petition for Partial Reconsideration and Clarification of the ATC Order, where is proposed an aggregate limit of 53.9.[135] At that time this proposed number was rationalized by assuming that 1000 base stations would be visible from an aircraft at an altitude of 1000 ft, and that each base station would radiate the equivalent EIRP in any sector of 19.1 dBW on three channels.[136] Based on Inmarsat's demonstration that its receivers are susceptible to harmful interference at 15 dB lower level than assumed in the Commission's analysis, as explained above, any maximum aggregate EIRP from all ATC base stations within a

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134 See Appendix B.

135 Inmarsat notes that the currently proposed value in MSV's ATC Applications is 58.3 dBW, but Inmarsat can find no calculation or rationale in MSV's ATC Application to support such a number. MSV does mention this EIRP value in one of its sets of simulation results in Figure 8 of its February 4, 2004 ex-parte, although no rationale is given for the use of such a number there either.

136 The MSV proposed aggregate EIRP value of 53.9 dBW was derived from 10log(1000) + 10log(3) + 19.1 dBW.

50 mile radius that ultimately may be adopted should not exceed 38.9 dBW, and not 58.3 dBW as proposed by MSV. Furthermore, this limit would need to be carefully defined in terms of how the EIRP from multiple base stations is aggregated, so that for example it was not misinterpreted by taking account of blockage that would occur at ground level. Such an EIRP limit should apply assuming no blockage existed with respect to any of the ATC base stations, as this would be the most realistic scenario for an aircraft receiver at an altitude of 1000 ft. In short, MSV's waiver request is unsubstantiated and should be denied.

3. MSV's Waiver Request to Increase ATC Base Station EIRP Toward the Horizon Should Be Denied

MSV seeks a waiver of Section 25.253(d)(2),[137] asking that this rule be relaxed to allow an aggregate EIRP from an ATC base station up to a level of 33.9 dBW per sector towards the physical horizon (not to include man-made structures).

MSV's request for a relaxation of this rule is directly related to its request addressed in the section above. The current rule has an EIRP limit toward the horizon of 14.1 dBW, compared to the rule in Section 25.253(d)(1) which is a peak EIRP per sector of 19.1 dBW, and so assumes that the base station antenna gain toward the horizon is 5 dB lower than the peak gain. Assuming the three channel limit given in Section 25.253(d)(1), the aggregate EIRP limit towards the horizon in § 25.253(d)(1) and (2) is effectively 18.9 dBW, and MSV is instead proposing an aggregate limit of 33.9 dBW, which is 15 dB higher than the current rule. For exactly the same reasons as explained in Section IV.B.1 above, Inmarsat urges that the Commission deny MSV's waiver request and adopt an aggregate EIRP limit towards the horizon

137 "Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall not: . . . . (2) exceed an EIRP toward the physical horizon (not to include man-made structures) of 14.1 dBW per carrier in 200 kHz;" 47 C.F.R. § 25.253(d)(2).

of 3.9 dBW, which is 15 dB less than the current rule, as requested in Inmarsat's Petition for Reconsideration.

4. MSV's Waiver Request Regarding L-Band ATC Base Stations Near Airports Should Be Denied

In the *ATC Application*, MSV requests a waiver of Sections 25.253(d)(3) and 25.253(d)(4),[138] so that it need comply only either (d)(3) or (d)(4) and so that it need to comply with a lower PFD limit than the –73.0 $dBW/m^2/200$ kHz value in (d)(4).

a. *MSV Must Comply with Both The Proximity And PFD Restrictions On ATC Base Stations In Order To Protect Aeronautical METs*

The Commission's ATC service rules require ATC operators both to locate base stations a prescribed distance away from airports and to meet certain aggregate PFD levels at the edge of airports and runway stands. Compliance with each restriction is necessary to protect Inmarsat aeronautical terminals that provide vital safety and navigation services to aircraft.

The PFD limitation imposed by the Commission quantifies the interference that Inmarsat's terminals may suffer without unacceptable degradation in their performance.[139] Verifying PFD levels, however, can be complex. Continued monitoring to ensure that the proper PFD levels are maintained can be difficult for both satellite operators and aeronautical terminal users. As ATC base stations are configured and modified over time, the PFD level may fluctuate either intentionally or unintentionally. The proximity limits imposed by the Commission (*i.e.*, at

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138 "Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall not: . . . (3) locate any ATC base station less than 470 meters from all airport runways and aircraft stand areas, including takeoff and landing paths; (4) exceed an aggregate power flux density level of -73.0 $dBW/m^2/200$ kHz at the edge of all airport runways and aircraft stand areas, including takeoff and landing paths;" 47 C.F.R. § 25.253(d)(3) and § 25.253(d)(4).

139 Inmarsat has demonstrated that the protections set forth in proposed rules § 25.253(d)(3) and (4) underestimate the overload threshold for Inmarsat's aeronautical terminals. Therefore, Inmarsat has requested that the Commission modify its proposed rules to account for the correct overload threshold levels.

least 470 meters from all airport runways and aircraft stand areas, including takeoff and landing paths) provide an important assurance that even if PFD levels vary, aeronautical users will be protected from the most severe interference disruptions.

Distance alone, however, is not sufficient to protect Inmarsat aeronautical terminals. Extreme variations in PFD level may still impact MSS operations even if the ATC base stations are located at the edge of the distance permitted by the Commission. Thus, both restrictions are necessary to protect the important safety and navigation services the Inmarsat aeronautical terminals provide.

The Commission was aware of these considerations during the ATC proceeding and devised its rules accordingly. MSV offers no reason to distinguish their situation from that of other potential ATC applicants. Because, the rule is necessary to protect vital services and MSV provides no grounds that would justify a waiver, Inmarsat urges the Commission to deny MSV's waiver request.

b. *Existing PFD Restrictions Should Be Strengthened Not Relaxed*

MSV has questioned the accuracy of the Commission's calculation of the PFD limit in § 25.253(d)(4).[140] Inmarsat agrees with MSV concerning the calculation methodology for this PFD limit but strongly disagrees with the resulting PFD value proposed by MSV. Assuming a cross-polar discrimination of 8 dB for the Inmarsat receive antenna in the direction of the ATC base station, a PFD level of –64.6 dBW/m^2/200 kHz incident on the Inmarsat receiver from a single ATC base station and from a direction corresponding to 0 dBi gain for the Inmarsat receive antenna, measured in LHCP (the polarization transmitted by the ATC base station), will produce an aggregate received interfering signal level of –60 dBm in the Inmarsat

140 *See* MSV *ex parte letter*, IB Docket No. 01-185 (November 18, 2003), and Appendix K to the MSV ATC application.

receiver when there are three such carriers being transmitted from each of two ATC base stations. This PFD value of -64.6 dBW/m^2/200 kHz should therefore replace the Commission's value of -73 dBW/m^2/200 kHz, assuming that the -60 dBm sensitivity of the Inmarsat receiver was correct.

MSV, however, proposes a relaxation of 15 dB to increase the PFD limit from -64.6 to -49.6 dBW/m^2/200 kHz, based solely on MSV's assertion that Inmarsat's METs will tolerate -45 dBm before harmful interference occurs. Inmarsat has provided overwhelming evidence to the contrary.[141] The Inmarsat data shows conclusively that harmful interference will occur in the Inmarsat METs at levels of -75 dBm and possibly lower. The logical result from Inmarsat's data is that the corrected current limit in § 25.253(d)(4) should in fact be reduced by 15 dB, rather than increased by 15 dB as MSV proposes, and the minimum distance in Section 25.253(d)(3) should also be increased to account for the 15 dB greater sensitivity of the Inmarsat receivers.[142]

As a result of the above, Inmarsat urges the Commission to deny MSV's waiver request, and require that MSV comply with a minimum spacing requirement of 2,643 meters (relative to § 25.253(d)(3)) as well as the maximum PFD requirement of -79.6 dBW/m^2/200kHz (relative to § 25.253(d)(4)).[143]

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141 *See supra* Section IV.B.1.

142 The minimum distance of 470 meters in § 25.253(d)(3) will increase to 2,643 meters assuming the square law propagation model used by the Commission in its analysis, and the increase in receiver sensitivity of 15 dB.

143 The value of -79.6 dBW/m^2/200 kHz is derived by subtracting 15 dB from the corrected value of -64.6 dBW/m^2/200 kHz. This value of -79.6 dBW/m^2/200 kHz is the PFD (per carrier) produced by a single ATC base station.

5. MSV's Waiver Request Regarding Placement of L-Band ATC Base Stations Near Navigable Waterways Should Be Denied

MSV requests a waiver of § 25.253(d)(5)[144] to allow it to comply with a reduced PFD limit of–54.4 dBW/m²/200 kHz. MSV derives this proposed new PFD limit in two steps.

While Inmarsat agrees with MSV concerning the calculation methodology for this PFD limit, it strongly disagrees with the resulting PFD value proposed by MSV. Assuming a cross-polar discrimination of 8 dB for the Inmarsat receive antenna in the direction of the ATC base station, a PFD level of –69.4 dBW/m²/200 kHz incident on the Inmarsat receiver from a single ATC base station and from a direction corresponding to 7.8 dBi gain (13.2 dB below peak gain) for the Inmarsat receive antenna, measured in LHCP (the polarization transmitted by the ATC base station), will produce an aggregate received interfering signal level of –60 dBm in the Inmarsat receiver when there are three such carriers being transmitted from a single ATC base station. This PFD value of –69.4 dBW/m²/200 kHz should therefore replace the Commission's value of –64.6 dBW/m²/200 kHz, assuming that the –60 dBm sensitivity of the Inmarsat receiver was correct.

MSV then proposes a relaxation of 15 dB to increase the PFD limit from –69.4 to –54.4 dBW/m²/200 kHz, but this is based solely on MSV's assertion that Inmarsat's METs will tolerate –45 dBm before harmful interference occurs, despite the overwhelming evidence to the contrary provided by Inmarsat (See Appendix G).[145] The Inmarsat data shows conclusively that

144 "Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall not: . . . (5) locate any ATC base station less than 1.5 km from the boundaries of all navigable waterways or the ATC base stations shall not exceed a power flux density level of -64.6 dBW/m²/200 kHz at the water's edge of any navigable waterway;" 47 C.F.R. § 25.253(d)(5).

145 MSV's assessment was based solely on measurement of the nonlinear transfer characteristic, and corresponding small signal suppression in the Inmarsat METs. It

harmful interference will occur in the Inmarsat METs at levels of –75 dBm and lower. The logical result from Inmarsat's data is that the corrected current limit in § 25.253(d)(5) should in fact be reduced by 15 dB, rather than increased by 15 dB as MSV proposes, and the minimum distance in § 25.253(d)(5) should also be increased to account for the 15 dB extra sensitivity of the Inmarsat receivers.[146]

As a result of the above, Inmarsat urges the Commission to deny MSV's waiver request and require that MSV comply with a minimum spacing requirement of 2,643 meters as well as the maximum PFD requirement of –84.4 dBW/m^2/200kHz (relative to § 25.253(d)(5)).[147]

6. MSV's Waiver Request Regarding the Relaxation of the Overhead Gain Suppression Requirement for L-Band ATC Base Stations Should Be Denied

In Sections II.C(18) of its ATC applications, MSV is requesting a waiver of Section 25.253(e). This current rule reads as follows:

> Applicants for an ancillary terrestrial component in these bands must demonstrate, at the time of the application, that ATC base stations shall use left-hand-circular polarization antennas with a maximum gain of 16 dBi and overhead gain suppression according to the following:

Angle from Direction of Maximum Gain, in Vertical Plane, Above Antenna (Degrees)	Antenna Discrimination Pattern (dB)
0	Gmax
5...	Not to Exceed Gmax – 5
10...	Not to Exceed Gmax – 19
15 to 30...	Not to Exceed Gmax – 27
30 to 55...	Not to Exceed Gmax – 35

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totally ignored the harmful interference to the METs caused by intermodulation product interference in the METs, for which Inmarsat has provided ample data.

146 The minimum distance of 1,500 meters in § 25.253(d)(5) will increase to 8,435 meters assuming the square law propagation model used by the Commission in its analysis, and the increase in receiver sensitivity of 15 dB.

147 The value of –84.4 dBW/m^2/200 kHz is derived by subtracting 15 dB from the corrected value of –69.4 dBW/m^2/200 kHz. This value of –84.4 dBW/m^2/200 kHz is the PFD (per carrier) produced by a single ATC base station.

55 to 145	Not to Exceed Gmax – 40
145 to 180......................................	Not to Exceed Gmax – 26

Where: Gmax is the maximum gain of the base station antenna in dBi.

MSV requests that the rule be relaxed to modify the table above as follows:

Angle from Direction of Maximum Gain, in Vertical Plane, Above Antenna (Degrees)	Antenna Discrimination Pattern (dB)
0	Gmax
5..	Not to Exceed Gmax – 5
10...	Not to Exceed Gmax – 19
15 to 55...	Not to Exceed Gmax – 27
55 to 145	Not to Exceed Gmax – 30
145 to 180......................................	Not to Exceed Gmax – 26

The proposed changes affect the angular ranges from 30° to 55° (8 dB less isolation) and from 55° to 145° (10 dB less isolation).

MSV claims that the overhead gain mask proposed by the Commission in the *ATC Order* and now embodied in § 25.253(e) is overly restrictive and ". . . will require L-band ATC operators to incur significant and unnecessary costs as well as production difficulties in deploying base stations." This is remarkable considering that the § 25.253(e) mask is completely consistent with the original MSV application for its ATC system, where this mask is provided for the MSV "specially designed antenna," and further assertions by MSV in subsequent pleadings that this level of performance will be achieved.

The Commission, in the *ATC Order*, investigated the feasibility of an ATC base station antenna meeting the Section 25.253(e) mask, particularly as regards the –40 dBi overhead gain suppression is concerned. Based on actual measurement data, the Commission confirmed that such performance is entirely feasible, "...even with an antenna not specifically designed for

ATC operations."[148] It is therefore surprising that MSV feels the need now to back away from its previous claims, which were fully supported by the Commission's own analysis.

As usual, MSV has attempted to mask the impact of its proposed antenna change by a complex statistical approach. However, the facts are simple. The MSV proposal to relax the overhead gain suppression will impact the safety of an aircraft using an Inmarsat receiver at the most critical times – just before landing and just after taking off. This is because the aircraft is most likely to be overhead, or nearly overhead, relative to an ATC base station, and at a low altitude, at this point in its flight.

The effect of the proposed MSV relaxation in the overhead gain suppression of its base station antenna is shown in the following diagram, where the onset of overload in the Inmarsat receiver is shown as a function of the horizontal and vertical distances between the aircraft and the ATC base station.[149]

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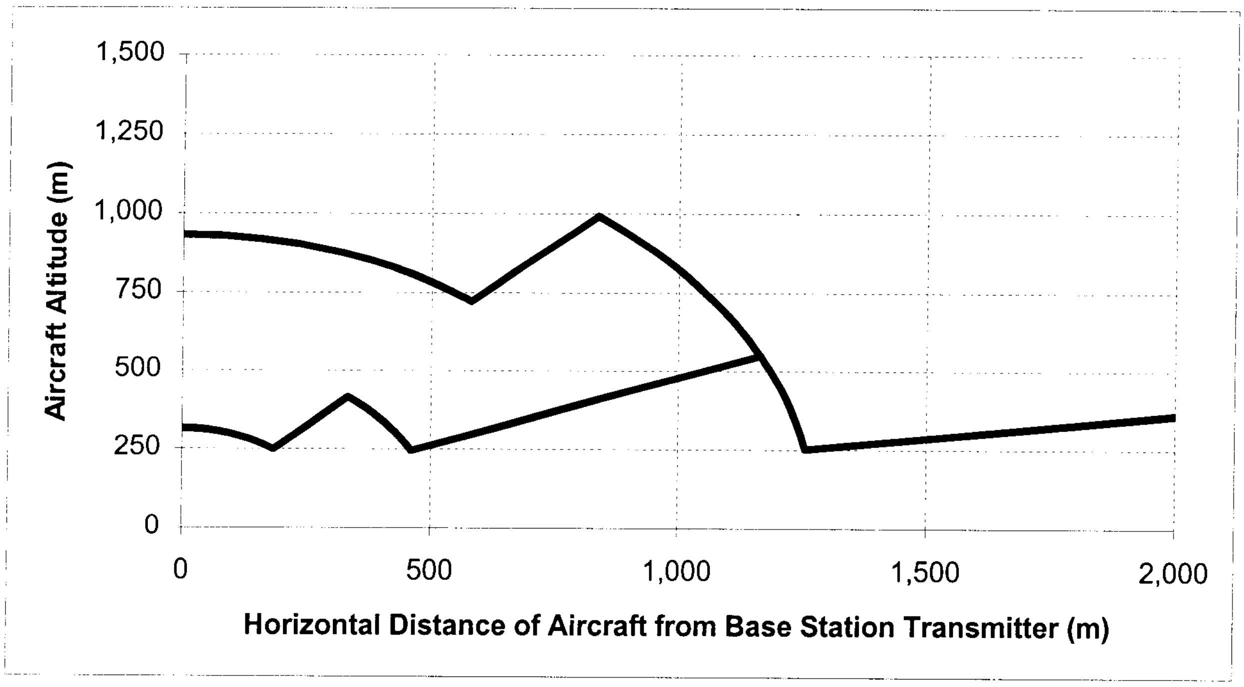
148 *See ATC Order ¶ 193.*

149 This analysis is based on an overload threshold of –75 dBm at the input of the Inmarsat receiver, a value supported by the measurements made by the Inmarsat receiver manufacturers. *See supra* Section IV.B.1. The relative effect of the change proposed by MSV would be similar for other thresholds.



The lower line corresponds to the mask in the ATC rules, while the upper line is for the proposed MSV mask. As is shown, overload would occur at much higher altitude (750-1000 meters for the MSV proposed mask compared to 250-500 meters for the § 25.253(e) mask) for horizontal distances of less than 1 km. Therefore aircraft flying on runway approaches that happen to be overhead of ATC base stations will be affected for significant volumes after take-off and before landing as a result of the proposed MSV relaxation of this rule.

Furthermore, it is important to note that all the detailed analyses performed by the Commission and others (including Inmarsat and NTIA) of potential interference from ATC base stations to aircraft in flight have been based on the overhead gain mask proposed by MSV. It is therefore inconceivable that the Commission could entertain a significant relaxation in this crucial gain mask in the application processing stage, and based on the last-minute results presented by MSV. With safety of life issues at stake, Inmarsat strongly urges the Commission to reject this latest ruse of MSV. MSV has provided no reason that warrants a waiver of the Commission's rules.

CONCLUSION

For the reasons discusses above, the MSV's *ATC Application* is deficient and should be denied or dismissed.

Respectfully submitted,

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Appendix A

MSV's Proposed Interference Cancellation Scheme Is Meritless

The latest MSV scheme for interference cancellation amounts to no more than a reproduction of classical theoretical interference cancellation techniques. While theoretically appealing, such a system is impractical for MSV's next generation system and would substantially undermine MSV's current MSS operations.

I. MSV's Cancellation Scheme Would Be Expensive and Require an Inordinate Amount of Spectrum

In promoting its cancellation scheme, MSV provides no explanation of the hardware required to implement such a sophisticated system, or of how such a system would cope with the realities of the MSV satellite system. The sketchy MSV description simply states that "the signals that are intercepted by the 'desired' satellite cell (cell 1) and by the neighboring satellite cells, over the frequency span of the desired signal, are transported to the satellite gateway where they are linearly combined via fractionally-spaced transversal filters to form an optimum decision variable in accordance with a Least Squared-Error criterion."[1] MSV, however, fails to explain how the signals are "intercepted" and, more importantly, transmitted to the gateway.

It is evident that the interfering ATC signals that spill over from the adjacent cells to Cell 1 (the desired cell) will be part of the signal down-linked to the satellite gateway. However, the signals supposedly "intercepted" in the adjacent cells will not be within those cells' frequency assignments, and will therefore be filtered off. In order to implement what MSV has in mind, each of these adjacent cells would have to carry channels to receive the interfering ATC signals. Since any cell, in MSV's scheme, could contain ATC base stations using the channels of any of the adjacent cells, potentially all the channels of all six adjacent cells would have to be monitored for interference in a particular cell. Hence, any given cell would have to carry up to seven times the number of channels that would be needed for MSS traffic alone.[2] Only a minority of these channels would be used to carry MSS traffic – the majority (up to six times as many) would be dedicated to "intercepting" interference signals using other frequencies. The MSV satellite would therefore have to increase the number of channels in the satellite by a factor of seven, with a significant resulting impact on satellite complexity and cost.

A related, and potentially even more problematic effect of MSV's proposed interference cancellation technique is that MSV would need seven times as much feeder link spectrum. This makes the MSV proposal a non-starter for several reasons. The additional feeder link spectrum requirements would significantly increase the complexity and cost of MSV's satellite.

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1 *ATC Application*, Appendix F p.2.

2 In accordance with MSV's description of its system, Inmarsat assumes a seven cell reuse design will be used by MSV.

In addition, MSV's scheme would require an inordinate amount of spectrum for interference monitoring, which mean other satellite operators would be blocked from using this spectrum to carry traffic. Finally, the amount of spectrum necessary to implement MSV's plan could not possibly be coordinated. The original MSV satellite application states that MSV needs 250 MHz of feeder link spectrum (in each direction) for its next generation satellite (without the interference cancellation capability). This need would multiply into *1.75 GHz* with the addition of MSV's interference cancellation technique – an amount that exceeds by far the internationally allocated FSS spectrum in the 13/11 GHz bands that MSV plans to use for its feeder links.

MSV has either not fully considered or has chosen to ignore the consequences of its proposal, because MSV's satellite application, including subsequent amendments, makes no mention of this increased feeder link spectrum requirement, or the additional satellite payload hardware necessary to implement the interference cancellation system.

II. Interference Cancellers

Another aspect that is not discussed in MSV's description is the extrapolation of the interference reduction technique to all the cells and geographical areas of the proposed MSV ATC system. The basic architecture illustrated in Figure 2 of Appendix F of MSV's *ATC Application* would have to be repeated to cancel all ATC interference sources throughout the MSV coverage area. Although MSV does not say so explicitly, it appears that MSV's intention is to have one interference canceller per satellite beam, which would supposedly cancel all ATC interference sources from the six adjacent beams. Using MSV's assumption, MSV would need about 200 interference cancellers.

However, one interference canceller per beam is not sufficient. Because a single canceller would not be able to cope with multiple, geographically separate, interference signals and each satellite beam receives ATC interference signals from all six adjacent beams (in a 7-cell re-use scheme) then there needs to be at least six cancellers per satellite beam. However, even this would not be enough, as there is likely to be several ATC areas in each beam, each requiring its own canceller. The cancellation of an interfering signal requires careful adjustment of the phase and amplitude of the cancellation signal relative to the wanted signal, and this phase and amplitude will be different for the various ATC locations within the MSV satellite beam. Therefore, to make the technique work, each ATC interference source (*e.g.*, a metropolitan area) would require its own canceller for each of the six adjacent beams. For example, the St. Louis ATC interference source would need its own interference canceller in each of the six adjacent beams, and the Kansas City ATC interference source, also likely to fall within the same MSV satellite beam, but far enough away to require a different amplitude and phase adjustment for the canceller, will require its own dedicated canceller in each of the six adjacent beams. The total number of interference cancellers could therefore be very large, again increasing the complexity and cost of the MSV system.[3]

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[3] Typically the total number of cancellers required would be equal to six times the number of interfering ATC hot-spots that require to be cancelled out in the adjacent beams, likely resulting in the need for thousands of interference cancellers.

An additional problem MSV would face in setting the parameters (filter coefficients) of the interference cancellers would be the variations in satellite antenna gain due to satellite inclination, thermal distortion, ageing, etc. For example, the diurnal and random variation in the satellite antenna sidelobe gain, which affects the level of the ATC interference into adjacent beams could be several dB and this would require the interference cancellers to be constantly adapting their phase and amplitude to provide adequate interference cancellation. An even more dramatic effect results from the movement of a satellite in inclined orbit, which could cause satellite antenna gain variations of 20-30 dB.

The interference cancellation scheme proposed by MSV is pretty on paper, and under highly controlled simulations may be shown to reduce self-interference, but the practicalities raised above (and possibly other issues that would come to light if MSV actually tried to implement the scheme) demonstrate that MSV's exotic interference cancellation scheme is totally impractical from a cost, engineering and spectrum availability perspective. The plan will never be implemented sufficiently to achieve the stated self-interference cancellation objectives of MSV. It is simply "pie in the sky."

III The Cancellation Scheme Would Devastate MSV's Current MSS Service

Although it is MSV's stated intention to implement this technique with its current satellite, MSV could not do so without completely undermining its current satellite service. Unlike for its next generation satellite, it is of course impossible for MSV to modify the existing in-orbit MSV satellite to increase the capacity or feeder link frequency range. Hence, the effect of implementing the interference cancellation technique with MSV's current satellite would be that only 1/7th of the MSV satellite capacity would be available for MSV to carry MSS traffic - the rest would have to be dedicated to interference monitoring. This would mean that MSV's proposed ATC system would not be "ancillary" by any stretch of the imagination. The ATC component would instead render the MSV satellite system virtually useless.

Receiver blocking caused by External interferer in L band
BER performance on Nera Worldcommunicator

1. PURPOSE

The purpose of the measurements is to determine the interference power level that causes harmful interference to a Nera Worldcommunicator GAN terminal at different frequency offsets. The tests are performed both with a single interfering GSM carrier and with two GSM carriers that generate an interfering intermodulation product.

2. ENVIRONMENTAL CONDITIONS

Normal ambient

3. TEST PROCEDURES

3.1 Test Equipment

- Rohde&Schwarz SMIQ 03B
- Marconi Instruments, Signal Generator 2031
- Noise/Com NC 6110 Noise Generator
- Hewlett-Packard 89441A Vector Analyzer for calibration
- Agilent 778D Dual Directional Couplers
- Signal generators:
  - Marconi Instruments, Signal Generator 2031
  - Rohde&Schwarz SMIQ 03B
- IBM compatible PC's (One for generating the known symbol sequence and another for the vtLite)
- Filters, attenuators, mixers, splitters and combiners

3.2 Test Set-Up

3.2.1 The GSM interference signal

GSM modulation is used. Below is the configuration of the GSM signal and Figure 3.2.1 shows the frequency spectrum of the signal.

Modulation type	GMSK
Symbol size	1 bit
Symbol rate	270.883333 ksps
Filter type/param	Gaussian/0.3
Data format	PN15

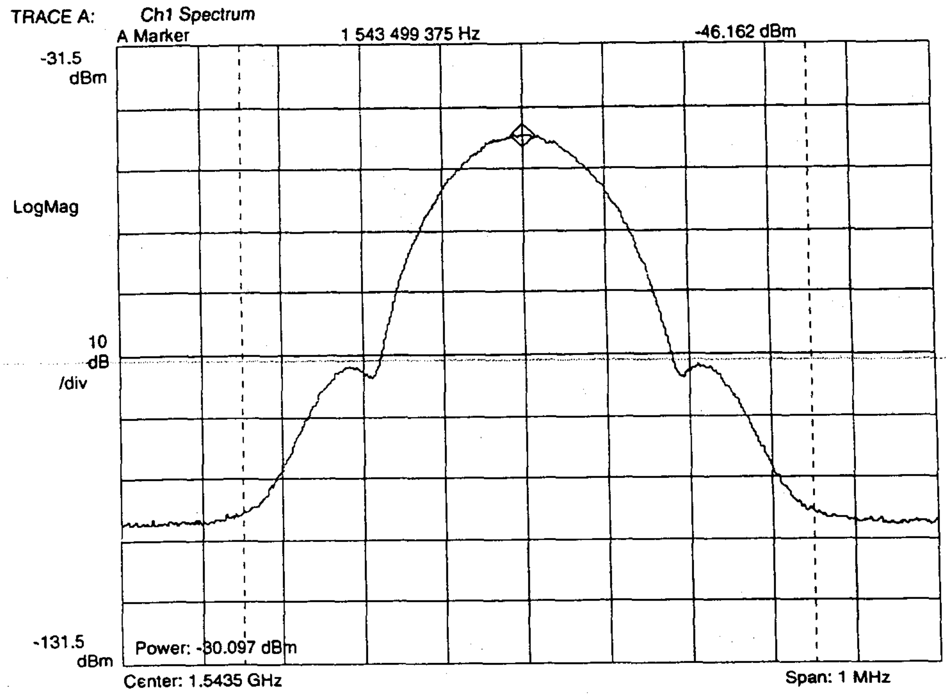

Figure 3.2.1. Transmitter spectrum of the GSM signal.

3.2.2 Only one GSM interferer channel

The test setup is shown in Figure 3.2.2. An SMIQ signal generator is used as a continuous 64kbit/s data SCPC transmitter at the receive channel. An IBM compatible PC feeds the SMIQ signal generator with the known symbol sequence.

In order to obtain the required C/No, White Gaussian Noise (WGN) and is added before the signal is applied to the antenna port of the receiving MES.
To calibrate the received signal to noise ratio into the MUB, a vector analyzer is used. The IF signal is drained using a Coupler.

To calibrate the "GSM" signal power into the RFB, a vector analyzer is used. The L band signal is drained using a Coupler.

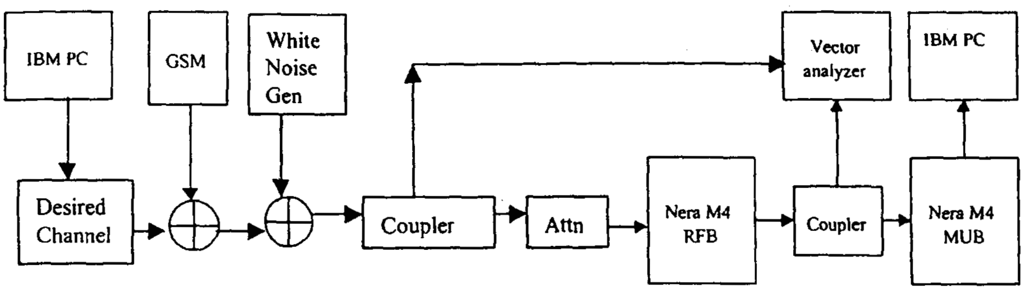

Figure 3.2.2. Block diagram of the test set-up for one GSM signal.

Test procedure:

1) The SMIQ is set up to transmit a continuous SCPC signal at the receive frequency, 1542.0 MHz. The data and SU fields of the transmitted frame consist of a known data pattern (all zeros) before scrambling and FEC-encoding.
2) The rx channel signal level is calibrated to 3dB above minimum (-63dBm input MUB). WGN is added. The SNR is calibrated to a C/No of 53.2 dBHz by means of the Vector analyser.
3) The receiving MES, which is tuned to the correct Rx-channel, is started. After sync is acquired, the MES starts to count the number of bits in error (the ones which differs from the known all-zeros pattern). Each time 60 new frames are received, the MES writes the accumulated number of bit errors to the PC. A program running on the PC writes the BER to the PC screen.
4) The GSM signal is set up at 1542.0 MHz with frequency offset from 0.15 to 14.0MHz. The power level is adjusted until bit errors start to occur, and the level is measured by the Vector analyzer.
5) Make the mesurement on both sides of the center frequency, 1542.0 MHz.

3.2.3 Intermodulation measurement with two interferers

The set up is the same as above, except instead of one GSM signal two unmodulated RF signals are used as shown in Figure 3.2.3.1. Two 20dB attenuators are added to each interferer channel to prevent intermodulation product of these two.

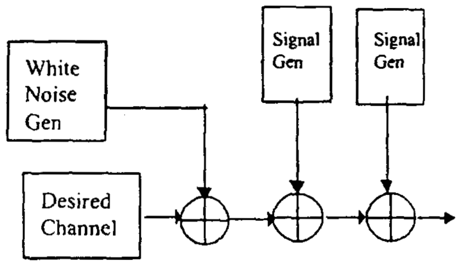

Figure 3.2.3.1 Interfering signals

Test procedure:

1. The test procedure is the same in step 1 to 3 as above.
2. The two interfering channels are configured with 2/4 MHz and 6/12MHz offset from the received frequency, 1542.0 MHz as shown in Figure 3.2.3.2. The power levels of both signal generators are adjusted until bit errors start to occur, and the total power level is measured by the Vector analyzer.
3. Make the mesurement on both sides of the center frequency, 1542.0 MHz

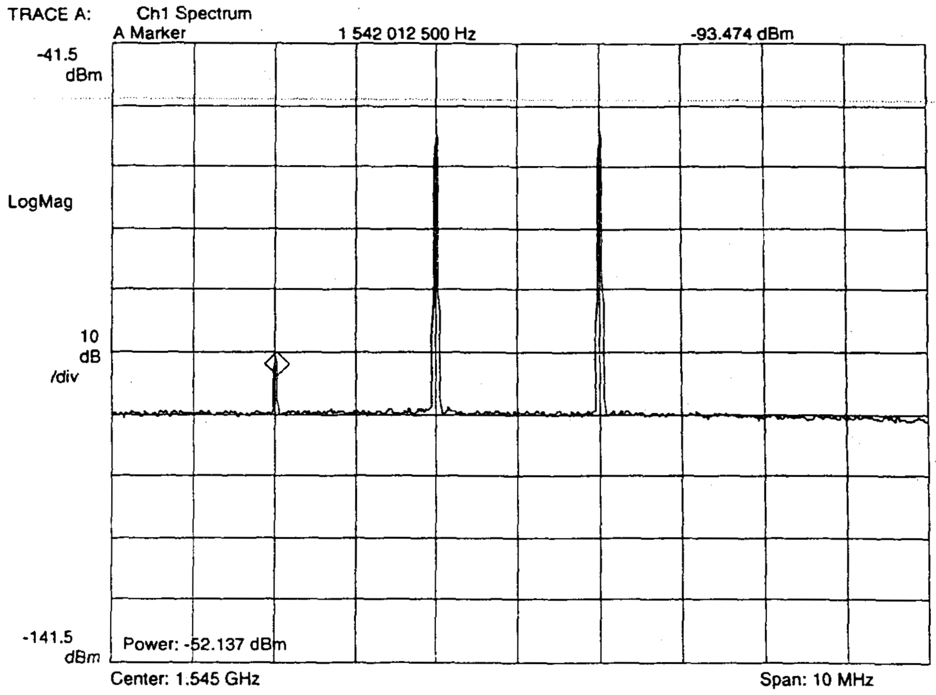

Figure 3.2.3.2 Interfering signals with the desired signal at 1542.0MHz

4. RESULTS

4.1 With one GSM carrier

Figure 4.1 shows the frequency offset on both sides of the center frequency, 1542.0 MHz versus power level in –dBm.

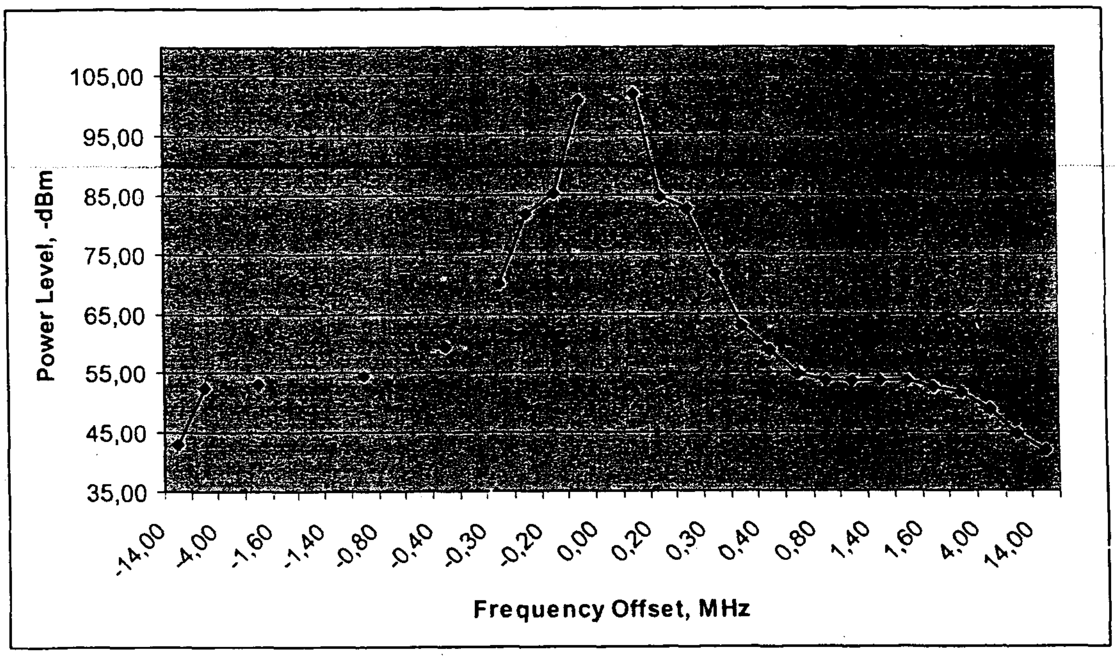

Figure 4.1 The frequency offset versus Power level

4.2 Intermodulation

The table below shows the harmful interference power level versus the pairs of frequencies of the two interferers .

Frequency Offset, MHz	Power Level, dBm
1538/1540	-74,1
1530/1536	-73,9
1544/1546	-72,6
1548/1554	-73,8

5. CONCLUSIONS

Intermodulation products generated by two GSM carriers cause harmful interference to the GAN terminal when the received interference power level is between –73 to –74 dBm. The same interference power level from a single GSM carrier causes harmful interference at an offset of around 300 kHz. It is concluded that to provide adequate protection from interference, the interference power should not be allowed to exceed these levels.

6. SIGNATURE

Signed [Engineer]:	Thomas Danglé	Date:	2003-07-04
Signed [Witness]:	Dag M. Larsen	Date:	2003-07-04
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July 7, 2003

Mr. Rohan Hiesler
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Dear Rohan:

You have asked me to review Appendices C1 and C2 from the FCC Order 03-15 authorizing ATC as a supplement to MSS service, and to determine whether the FCC has accurately calculated the saturation levels of Inmarsat receivers. I understand that Inmarsat intends to submit this letter to the FCC in support of a request that the FCC modify some of its rules governing ATC.

In the referenced documents, the FCC has taken the saturation level of Inmarsat receivers to be -50 dBm. As explained below, this is incorrect and based on a misinterpretation of relevant ARINC, RTCA and ICAO specifications.

The FCC quotes RTCA as having a standard that such receivers have a saturation level at that level. FCC Appendix C2, Section 1.12. That quote is referenced to a Boeing Ex Parte Letter, in which Boeing states: "The saturation level of -80 dBW shown in table 6, however, is the level required for an equivalent Aircraft Earth-Station (AES) receiver at L-band pursuant to standards published by RTCA Inc." [Boeing April 5, 2002 Ex Parte Letter at 10] Note that -80 dBW is equal to -50 dBm.

The FCC Appendix C2, Section 1.12 does correctly interpret ARINC 741 regarding the LNA as having gain between 53 and 60 dB and a 1 dB compression point at the LNA output of +10 dBm. Working those numbers back to the LNA input does yield an input level of -50 dBm as the input level at which saturation of the LNA may occur. However, saturation of the LNA is not the limiting factor. Other stages or components of a SATCOM receiver down-stream from the LNA are susceptible to saturation at a lower level.

RTCA DO-210D, Section 2.2.4.1.3, states that the receiver must work at its normal sensitivity levels for P-channels and C-channels with interference that is more than 1 MHz off-channel at -72 dBm. Furthermore, DO-210D, Change 2, Section 2.1.9 says that the on-channel susceptibility level for CW is -163.2 dBm and for broadband it is -184.9 dBm/Hz in terms of spectral density.

Rather than using just the "saturation" level of the LNA, any calculation of saturation levels in Inmarsat receivers must consider the level of interference where the receiver itself may cease to function normally.

The FCC, in Appendix C2, Section 2.2.3.2, shows an analysis summarized in Table 2.2.3.2.A for a simulation model used by the FCC that considers aircraft at a stated altitude above the ground-based emitter and they came to the conclusion that the AES would have a 10 dB margin with respect to the -50 dBm saturation level. However, if the saturation level is -72 dBm per RTCA DO-210D, Section 2.2.4.1.3 for emissions that are more than 1 MHz removed from the active Inmarsat channel, then there is a 12 dB deficit rather than a 10 dB margin. If the separation between interference and the active channel is less than 1 MHz, the deficit for CW interference will decrease, and could be as large 113.2 dB for the co-channel case.

It appears that the ARINC LNA specification was incorrectly interpreted as the point at which Inmarsat SATCOM receivers would stop functioning. There is nothing in minimum operational performance standards of DO-210D that requires a receiver has to function normally with an interference level as high as -50 dBm. It appears, therefore, that the ARINC specifications for the LNA may have been confused with RTCA MOPS requirements. A conclusion that adequate protection of Inmarsat receivers from interference is achieved at -50 dBm is unsubstantiated based on the existing industry documents. As set forth above, a much more conservative protection level is warranted, taking into account all relevant ARINC, RTCA, and ICAO specifications.

Orville K. Nyhus, PhD

[illegible], PhD for OKN 7/7/2003

Principal Fellow
Honeywell Aerospace Electronic Systems

ENGINEERING INFORMATION CERTIFICATION

I hereby certify that I am the technically qualified person responsible for reviewing the engineering information contained in the foregoing submission, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

Richard Barnett

Richard J. Barnett, PhD, BSc

Telecomm Strategies, Inc.
6404 Highland Drive
Chevy Chase, Maryland 20815

Dated: March 25, 2004

<u>CERTIFICATE OF SERVICE</u>

I, Alexander Hoehn-Saric, hereby certify that on this 25th day of March, 2004, the foregoing "Opposition of Inmarsat Ventures Limited" was served by hand(*) or via first class mail, postage pre-paid, upon the following:

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