Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules Regarding Maritime Automatic Identification Systems	)	WT Docket No. 04-344
	)	
Petition for Rule Making Filed by National Telecommunications and Information Administration	)	RM-10821
	)	
Amendment of the Commission's Rules Concerning Maritime Communications	)	PR Docket No. 92-257

Comments of ORBCOMM

Pursuant to Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415 and 1.419, ORBCOMM Inc. ("ORBCOMM") hereby comments on the Further Notice of Proposed Rulemaking in this proceeding.[1] As explained in greater detail herein, ORBCOMM strongly supports the proposal of the National Telecommunications and Information Administration ("NTIA) and the Commission to allocate both VHF maritime Channels 87B (161.975 MHz) and 88B (162.025 MHz) exclusively to Automatic Identification Systems ("AIS") on a nationwide basis, not just in the nine VHF public coast service areas ("VPCSAs") originally proposed by the Commission. In particular, ORBCOMM believes that allowing non-AIS terrestrial transmitters in

[1] *Amendment of the Commission's Rules Regarding Maritime Automatic Identification Systems*, 21 FCC Rcd 8892 (2006) at ¶¶ 51-52 (hereafter cited as "*AIS Order and Further NPRM*"); 71 Fed Reg 60102-06 (October 12, 2006).

Channel 87B in VPCSAs 10-42 will substantially degrade the ability to provide AIS data on ships at sea for homeland security efforts. In contrast, adopting the proposed nationwide allocation will well serve the public interest.

ORBCOMM is a global satellite data communications company that provides reliable, cost-effective data communications services to customers around the world through its unique low-earth orbit ("LEO") satellite network and global ground infrastructure. ORBCOMM is the sole Commission-licensee in the Non-Voice Non-Geostationary Mobile Satellite Service ("NVNG MSS"). ORBCOMM provides service via its constellation of satellites, and presently operates in the VHF and UHF bands. A diverse customer base uses ORBCOMM services to track, monitor and control mobile and fixed assets, including trucks, containers, marine vessels, locomotives, heavy machinery, pipelines, oil wells, utility meters and storage tanks anywhere in the world.

Of particular relevance to this proceeding, ORBCOMM is also intending to use its new satellites to monitor AIS transmissions and furnish that information to the U.S. Coast Guard. ORBCOMM has entered into an agreement with the U.S. Coast Guard to provide AIS monitoring services on a demonstration basis using a satellite that will be launched later this year or early next year.[2] Assuming that demonstration proves successful, ORBCOMM is likely to incorporate AIS monitoring capabilities into its new satellites that will be launched in the near future, which

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[2] U.S. Coast Guard Contract No. HSCG23-04-C-ADA001. *See also, Press Release,* "ORBCOMM Receives U.S. Coast Guard Contract to Develop Satellite Technology," June 3, 2004 (available at http://www.orbcomm.com/wwwroot/public/news/readNewsArticle.jsp?ARTICLE_ID=80);

will comprise an important component of the U.S. Coast Guard's domain awareness responsibilities, which in turn is critical to homeland security.

The Commission acknowledges the important role AIS monitoring will play in helping the U.S. Coast Guard protect our Nation's shores. In its decision allocating Channel 87B to AIS, the Commission observed:

> In sum, we believe that AIS is an important tool for combating terrorism and a significant advancement in maritime navigation technology. Based on the record before us, we are persuaded that our promotion and facilitation of AIS deployment will save lives, strengthen the integrity of our borders, protect port operations that are vital to the United States economy, and promote a healthy and secure marine environment. Given the importance of AIS to homeland security and maritime safety, we also believe that, absent compelling reasons, the Commission should adopt rules that will best ensure that AIS is deployed widely, quickly, reliably, and cost-effectively, and in a manner that will maximize its capabilities. On the basis of this record, we believe that this goal can be most readily and best achieved by designating Channel 87B to be used for AIS on a wideband simplex basis. We therefore amend our rules as proposed, and designate Channels 87B and 88B for exclusive AIS use.[3]

Thus, there can be no question as to the public interest in facilitating U.S. Coast Guard monitoring of AIS transmissions – the issue before the Commission is whether the AIS exclusivity with regard to both Channels 87B and 88B should extend throughout the country in order to meet this goal. ORBCOMM maintains that it should.

The U.S. Coast Guard's operational goal is persistent wide area surveillance of passenger and cargo vessels over 65' in length within 2,000 nautical miles of the United States, a mandate of the Maritime

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[3] *AIS Order and Further NPRM* at ¶ 23.

Transportation Security Act of 2002.[4] ORBCOMM's satellite system is uniquely capable of fulfilling that mission – terrestrial stations simply cannot monitor AIS transmissions that far out to sea. Given the need for line-of-sight and the power levels of AIS transmissions (12.5 Watts), terrestrial towers in these VHS bands normally are only able to observe ships' AIS transmissions within approximately 50 miles of shore. This is far short of the 2,000 nautical miles the U.S. Coast Guard intends to monitor.

In contrast, ORBCOMM's low-Earth satellite constellation will allow reliable monitoring of AIS transmissions virtually anywhere on the planet. Presently, the ORBCOMM satellites are able to receive transmissions from its subscriber communicators that operate at 5 Watts; those messages, like the AIS transmissions, are digital signals that include location information similar to the AIS transmissions. Thus, ORBCOMM has a good understanding of its ability to reliably monitor the AIS signals.

ORBCOMM subscriber communicators are capable of operating at all latitudes. Given the power levels of the AIS transmissions, the ORBCOMM satellites will be able to process the AIS transmissions at least as well as its regular messages. ORBCOMM at present is successfully processing 15 million messages per month, and will be utilizing similar technology in monitoring the AIS transmissions. Thus, ORBCOMM will be able to support

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[4] Public Law 107-295, 116 Stat. 2109 (November 25, 2002); 47 U.S.C. § 70115. *See also*, NTIA Comments in WT Docket No. 04-344 at p. 24; Testimony of Mr. Jeffrey P. High before the Subcommittee on Coast Guard & Maritime Transportation, U.S. House of Representatives, October 6, 2004.

the U.S. Coast Guard's critical mission of monitoring ships at sea well before those ships reach the United States because it will be able to pick up those transmissions wherever the ships are, no matter how far offshore. In order to accommodate such monitoring activity, and to eliminate any doubt as to whether such monitoring complies with the Commission's requirements, ORBCOMM urges the Commission to modify the Table of Allocations in Section 2.106 of the Commission's Rules (either directly or via a footnote) to clarify that satellite monitoring of AIS signals in Channels 87B and 88B is permissible.[5]

The *AIS Order and Further NPRM* raises the question of whether it is adequate to allocate Channel 87B for AIS only in VPCSAs 1-9. The problem with not allocating Channel 87B for AIS on a nationwide basis, however, is that the satellites will also pick up signals from inland transmitters operating in Channel 87B, and if those transmissions are not AIS signals, then those "unwanted" transmissions could prevent ORBCOMM's satellites from receiving the AIS signals. In the case of such interference, ORBCOMM would not be able to provide the U.S. Coast Guard with the same ship-tracking information on a reliable basis.

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[5] *Cf., AIS Order and Further NPRM* at n. 291. To the extent that ORBCOMM will be using satellites to monitor "terrestrial" AIS transmissions, it is not clear whether it is necessary to allocate these frequencies to satellite services, but making such an allocation or adding a new footnote would eliminate any ambiguity.

The ORBCOMM satellite AIS receivers to be deployed in the next generation system will have a "footprint" of roughly 3,000 miles in diameter. The satellite's AIS receivers will be focused on the Earth, and can reliably detect transmissions from AIS transmitters at an elevation angle of 5º.[6] At the expected altitude of approximately 725 kilometers, the satellite receivers will "hear" transmitters within a "footprint" of some 3,000 miles.[7] That "footprint," however, will be constantly moving relative to the surface of the Earth as the satellite progresses in its non-geostationary orbit. Once the complete ORBCOMM constellation has been equipped with AIS receivers, the system will be able to monitor AIS transmissions from ships anywhere on the planet on a near-continuous basis. Thus, the ORBCOMM system will be uniquely capable of facilitating the U.S. Coast Guard's domain awareness capabilities.

With regard to any particular ORBCOMM satellite, however, the AIS receiver package will "hear" all transmissions in Channels 87B and 88B, whether those transmissions are AIS signals or not. Given the 3,000 mile "footprint" of the ORBCOMM satellite AIS receivers, if the Commission authorizes non-AIS use of Channel 87B outside the nine maritime VHF Public Coast areas, the satellite would receive non-AIS transmissions from significant "inland" areas in VPCSAs 10-42 while it is also monitoring ships

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[6] *See,* Appendix A, which reflects the AIS implementation uplink budget at a 5º elevation angle.

[7] The initial demonstration satellite will operate at a slightly higher altitude, and thus will have an even greater "footprint."

that are well offshore. By way of example, a satellite monitoring AIS transmissions from a ship 1,500 miles offshore would also be receiving signals from as many as 1,500 miles inland – slightly greater than the distance between San Francisco, California and Odessa, Texas.

Those non-AIS signals, in turn, would interfere with the satellite's receipt of the AIS signals, particularly given the relative power of transmissions authorized for such services (25 Watts for mobile units and 50 Watts for base stations[8]) versus the power levels of the AIS transmissions (12.5 Watts). ORBCOMM is developing protocols/algorithms that will allow it to deal with instances where there are simultaneous AIS transmissions from different ships within an ORBCOMM satellite footprint. However, those same techniques will not be able to handle simultaneous contentions from non-AIS transmissions. Moreover, these "inland" non-AIS signals will be operating at two to four times the power level of the AIS transmissions, and ORBCOMM foresees no reliable way of "filtering out" these more powerful undesired signals. Nor does ORBCOMM perceive any practical method of coordinating shared usage of this band, particularly because of the absence of any central control of AIS transmissions by ships at sea. Thus, non-AIS use of Channel 87B is highly likely to cause harmful interference to the ORBCOMM satellite's reception of the AIS signals and thus block

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[8] 47 C.F.R. § 80.215(c) and (e).

ORBCOMM's collection of the AIS transmissions in support of the U.S. Coast Guard's domain awareness program.

The problem is exacerbated to the extent that the U.S. Coast Guard is also intending to monitor AIS transmissions on inland waterways within the United States. Because ORBCOMM will be monitoring all AIS transmissions, not simply the ones from ships far out at sea, it is not intending to shut off the AIS receivers when the footprints are over inland territories.[9] Thus, there will be both frequency and geographic overlap between the desired AIS signals and the undesired non-AIS transmissions.

Finally, even if ORBCOMM was not intending to monitor inland waterway AIS signals, given the nature of non-geostationary satellite constellations and the relative size of ORBCOMM's satellites it would not be practical to incorporate AIS receivers that could constantly change the shape of the "footprints" to limit reception solely to offshore areas. Nor is ORBCOMM aware of any other means of preventing interference from any such non-AIS transmissions, given the use of the exact same frequencies.

In sum, Commission authorization of non-AIS transmissions outside of the nine VPCSAs on Channel 87B is likely to cause harmful interference to ORBCOMM's use of its satellites to monitor AIS transmissions in support of the U.S. Coast Guard. This, in turn, could hinder the U.S. Coast Guard in

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[9] Moreover, as explained above, given the 3000 mile "footprint" of the satellites, the ORBCOMM satellites would still "hear" transmissions on Channel 87B significantly inland when the satellites are also monitoring transmissions hundreds of miles offshore.

fulfilling its critical homeland security role. ORBCOMM thus fully supports the proposal to allocate Channel 87B exclusively to AIS throughout the United States. ORBCOMM also urges the Commission to clarify in its

Table of Allocations that monitoring of those signals by satellites is permissible. Such actions will well serve the public interest.

Respectfully submitted,

By /s/

Stephen L. Goodman
532 North Pitt Street
Alexandria, VA 22314
202/607-6756
Counsel for ORBCOMM Inc.

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APPENDIX A -- AIS Uplink Implementation Budget

	Nominal Eb/No	Sensitivity Limit	
Orbit Altitude	725	725	km
Reference Elevation	5	5	degrees
User Data Rate	9600	9600	bps
Uplink Frequency	162	162	MHz (mid band)
Wavelength	1.8	1.8	meters
Transmit EIRP	10.8	1.1	dBW
Spreading Loss	140.8	140.8	dB
Atmospheric Absorption	1.0	0.0	dB
Antenna Mismatch	4.1	4.1	dB (Max loss linear to 2 dB AR)
Fade Allowance	5.0	0.0	dB
Satellite Pointing Loss	-0.5	0	dB
Receive Flux Density	-131.0	-139.7	dBW/m2
Spacecraft Antenna Gain	1.5	1.5	dBi
Effective Antenna Area	-4.2	-4.2	dBm^2
Input Signal	-113.8	-118.0	dBm
Subscriber Receiver Noise Density	-170.28	-170.3	dBm/Hz
Received Pr/No	56.5	52.3	dBHz
Received Eb/No	16.7	12.5	dB
Required Eb/No	10.5	10.5	dB at 10^-5 BER
Interference Loss	3.5	0	dB
Implementation Loss	1.5	1.5	dB
TX Implementation loss	0.5	0.5	dB (CW, low phase noise)
Link Margin	1.2	0.0	
Threshold Pr/No	52.32		dBHz
Threshold Signal	-118.0		dBm
Threshold Flux Density		-139.7	dBW/m2

Noise Density Budget		
Antenna Temp	290	K
System Noise Figure	3.7	dB
System Temperature	28.3	dBK
Boltzmann's Constant	-198.6	dBm/Hz/K
System Noise Density	-170.3	dBm/Hz/K