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Before the
FEDERAL COMMUNICATIONS COMMISSION
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In the Matter of	)	
	)	
Flexibility for Delivery	)	IB Docket No. 01-185
of Communications by	)	
Mobile Satellite Service Providers	)	
in the 2 GHz and, the L-Band, and the	)	
1.6/2.4 GHz Band	)	

COMMENTS OF
INMARSAT VENTURES PLC

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EXECUTIVE SUMMARY

Inmarsat Ventures plc ("Inmarsat") is the owner and operator of a geostationary orbit mobile satellite service (MSS) system that provides service at L-Band throughout the world, including the United States. Inmarsat's comments on the Flexibility NPRM focus on the unique and particularly problematic frequency interference, safety and legal issues that arise from the proposed use of the L-Band for terrestrial purposes.

Consistent with the ITU Table of Frequency Allocations, the L-Band currently is allocated in the United States for MSS. As a successful and growing MSS service provider who does not have access to sufficient L-Band spectrum for its own business, Inmarsat opposes any attempt to allocate the L-Band for terrestrial services in the United States in contravention of the ITU Table. Specifically, Inmarsat opposes both the request of Motient Services, Inc. ("Motient") to add a terrestrial component to its MSS satellite network, as well as any proposal to allow other companies to operate terrestrial services in the L-Band.

Terrestrial use of L-Band frequencies would cause unacceptable interference to Inmarsat's system both outside and within the United States, exacerbate the current shortage of MSS spectrum, and violate the United States' treaty obligations under the ITU Radio Regulations and under a separate international coordination agreement.

Inmarsat offers a wide range of services to users who have mobile communications needs or who are beyond the reach of terrestrial communications networks. Governments, companies and individuals use Inmarsat's satellite system for communications purposes including aeronautical and maritime navigation, distress messaging, search and rescue operation coordination, remote reporting, video transmission, Internet access and voice communications. The U.S. Navy and Coast Guard, CNN, NPR, the Red Cross, and nearly every

major airline and shipping line are examples of the types users who rely on Inmarsat for their critical communications needs. Inmarsat has built a vibrant business serving these types of needs, rather that attempting to compete with PCS and cellular providers.

Terrestrial use of the L-Band poses five main interference problems that affect Inmarsat:

- The in-band signals of terrestrial mobile terminals would cause unacceptable interference to the signals being received by the Inmarsat satellites;
- The out-of-band emissions from terrestrial mobile terminals would cause unacceptable interference to the signals being received by the Inmarsat satellites;
- Terrestrial base stations' in-band signals would create unacceptable interference into the receivers of nearby Inmarsat mobile terminals;
- Terrestrial base stations' out-of-band emissions would create unacceptable interference into the receivers of nearby Inmarsat mobile terminals; and
- Motient's terrestrial uses would degrade the performance of its own space-based services and reduce the traffic-carrying capacity of the Motient space segment, thereby increasing Motient's need for L-Band spectrum.

These terrestrial sources of interference would (i) interfere with the operation of the Inmarsat spacecraft, (ii) disrupt the provision of services to Inmarsat's customers, (iii) threaten the provision of safety services over the Inmarsat system both inside and outside the United States, and (iv) exacerbate the shortage of critical L-Band MSS spectrum.

The ITU Table of Frequency Allocations does not provide any primary allocations for terrestrial services in the United States at the L-Band. The United States is free not to follow the ITU Table within its borders, but only as long as those other uses do not cause interference outside the borders of the United States. L-Band terrestrial services in the United States would cause unacceptable interference into the operation of the Inmarsat system (and the other MSS systems) outside the borders of the United States. Thus, consistent with its

obligations under the ITU Radio Regulations, the United States may not authorize terrestrial service at L-Band.

The scarcity of L-Band spectrum for MSS uses has led the United States to enter into a memorandum of understanding ("MOU") with the United Kingdom, Mexico, Russia and Canada regarding the coordination of L-Band spectrum for MSS service over North America. Under the terms of the MOU, operators must meet annually to evaluate their comparative MSS needs and reassign spectrum from satellite operators with less demand to satellite operators with greater demand. L-Band spectrum is not internationally allocated for terrestrial purposes over North America and the parties who negotiated the MOU never intended that it be used in such a manner, or taken into account in their annual meetings. Terrestrial uses of the L-Band in the United States would preclude MSS system operators from accessing the spectrum they need to operate and exacerbate existing coordination and spectrum scarcity problems among MSS operators.

It strains credibility to suggest that the proposed L-Band terrestrial component will really be ancillary to Motient's satellite system. Motient intends to build its terrestrial network in urban areas. And while Motient suggests that its terrestrial transmitters will cover only about 1% of the land mass of the United States, the fact remains that approximately 32 million people live in an area one-fifth this size -- the 0.18% of the United States that constitutes the area of the twenty-five most populous cities.

Finally, in contrast with the serious problems presented by Motient's proposal, no significant benefit would be obtained by allowing Motient to add a terrestrial component to its satellite network. Motient would become yet another nationwide mobile communications carrier in the United States serving predominantly urban areas. If Motient needs to provide limited fill-

in service in areas where its satellite signal is blocked, it should use dual-band handsets that use PCS or cellular frequencies to communicate terrestrially.

In sum, authorizing terrestrial use of the L-Band would create unacceptable interference into Inmarsat's MSS system and violate a number of the United States' international obligations. For these reasons and those set forth in greater detail herein, Inmarsat urges the Commission to maintain the L-Band solely for satellite-based services.

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COMMENTS OF INMARSAT VENTURES PLC

Inmarsat Ventures plc ("Inmarsat") hereby submits its comments in support of retaining the L-Band[1] solely for satellite-based services and in opposition to Motient Services, Inc.'s ("Motient's") application to integrate terrestrial components into its MSS satellite network,[2] as well as any other attempt to allow terrestrial use of the L-Band in the United States. Inmarsat has an interest in this proceeding as an owner and operator of a geostationary orbit MSS system that operates across the L-Band around the world, including within the United States. Inmarsat's comments below focus on the unique and particularly problematic frequency interference, safety and legal issues that arise from the proposed use of the L-Band for terrestrial purposes.

The *Flexibility NPRM* is, in large part, prompted by Motient's application to add a terrestrial component to its L-Band satellite network.[3] However, the Commission also asks

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1 L-Band refers to the frequencies allocated for MSS and aeronautical mobile-satellite (R) service at 1525-1559 MHz and 1626.5-1660.5 MHz.

2 *See In the Matter of 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 Band, Notice of Proposed Rule Making*, IB Docket No. 01-185 and ET Docket No. 95-18 (rel. August 17, 2001) (the "*Flexibility NPRM*").

3 *See Mobile Satellite Ventures Subsidiary LLC Application for Assignment and Modification of Licenses and for Authority to Launch and Operate a Next-Generation Mobile Satellite System, et al.*, File No. SAT-ASG-20010302-00017, et al. (filed March

whether it should consider opening the L-Band for terrestrial uses by other companies. The Commission should not allow terrestrial use of the L-Band for four main reasons: (i) terrestrial uses would create unacceptable inference to Inmarsat's network, including vital safety services provided in the L-Band, and nearby frequencies; (ii) terrestrial uses would violate the United States' treaty obligations under the ITU Radio Regulations and under a separate international coordination agreement that governs use of the L-Band over North America, to which the United States is a party; (iii) such terrestrial uses would exacerbate existing spectrum scarcity problems in the L-Band; and (iv) Motient's desire to serve the areas where its satellite signals are weak can be met by using dual-band phones that operate in terrestrial frequencies without raising these interference, legal and policy impediments.

I. INMARSAT OPERATES A SUCCESSFUL MSS BUSINESS

The questions and proposals in the NPRM reflect a fundamental misperception about the state of the MSS industry. Namely, some advocates for using the L-Band terrestrially have asserted that no mobile satellite business is currently successful, that every MSS system needs to augment its operations with a terrestrial component in order to survive, and that parts of the L-Band are lying fallow and are not needed for MSS.[4] Nothing could be further from the truth. Inmarsat is a successful commercial operator of a global MSS network and has no need for an ancillary terrestrial component. The L-Band is a critical resource in limited supply, and Inmarsat's continued need for L-Band spectrum is driven by the increasing demands of its customers.

1, 2001) (the "*Application*"); *see also* Public Notice, Report No. SAT-00066 (rel. March 19, 2001).

4 *See, e.g., Flexibility NPRM* at ¶¶ 25, 28, 37.

A. Inmarsat's Satellite Network

Inmarsat is the largest satellite network provider of mobile communications and data services and, since its privatization, has developed from an intergovernmental organization into a vibrant commercial business. As Inmarsat has entered new markets, its customer base has continued to grow. Already there are over 220,000 Inmarsat terminals registered for use on the land and sea, and in the air, around the world. In the United States, Inmarsat currently provides certain maritime services to ships, and aeronautical services to international flights. Now that its service providers have recently received authorization from the Commission, Inmarsat intends rapidly to expand its land-mobile and aeronautical mobile service offerings throughout the United States.[5]

Inmarsat currently has two generations of satellites in orbit, Inmarsat-2 and Inmarsat-3, and has coordinated the use of L-Band spectrum between 1525-1559 MHz and 1626.5-1660.5 MHz. Four Inmarsat-2 satellites were launched in the early 1990s at a cost of approximately $675 million and are in geostationary orbit at 179° E.L., 98° W.L., 142° W.L. and 109° E.L. These four satellites have allowed Inmarsat to provide communications and safety services to virtually every corner of the globe. From the start, demand for Inmarsat's services has grown rapidly and in the mid to late 1990s, Inmarsat launched its next generation of satellites, Inmarsat-3s, at a cost of $895 million. These satellites are now in geostationary orbit at 64° E.L., 15.5° W.L., 178° E.L., 54° W.L. and 25° E.L. The five Inmarsat-3 satellites, including one in-orbit spare, provide worldwide coverage using both global beam and spot beam technology.

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5 *See* In the Matter of Comsat Corporation d/b/a Comsat Mobile Communications, et al., *Memorandum Opinion, Order and Authorization*, File No. ITC-97-22, et al. (rel. October 9, 2001) (the "*Inmarsat Authorization*").

Currently, Inmarsat is expanding its network and capacities through the development and deployment of the Inmarsat-4 satellites, at a cost of approximately $1.72 billion. Inmarsat intends to launch at least two of these satellites within the next two to three years. These satellites are designed to support high bandwidth data services at L-Band through global, wide spot and narrow spot beams.

Starting next year, Inmarsat intends to further expand its system by introducing broadband MSS services on a regional basis. Inmarsat's Broadband Global Area Network service ("B-GAN service") initially will offer data transmission rates of up to 144 kbps, with speeds increasing to 432 kbps by 2004.

B. Inmarsat Offers A Diverse Range Of Services

Inmarsat offers mobile communications solutions via satellite to customers at sea, on land and in the air. Inmarsat's service allows individuals to communicate with others regardless of whether they are at the top of a mountain, in a field, in the air, or in the middle of the ocean.[6] Where no other communication service will reach and where weather or disasters preclude use of terrestrial networks, Inmarsat's MSS system provides a vital link for private and governmental users alike.

Specifically, Inmarsat offers telephony, data, e-mail, fax, digitally compressed video, and Internet access services to end users through a world-wide network of approximately two hundred distributors and service providers. As described below, Inmarsat has created a successful and growing business based on the deployment of a global satellite system that

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6 "The Commission has recognized the value of MSS to provide advanced communications on a global basis to areas that may not be readily or economically served by terrestrial systems, such as rural and remote areas, and to the maritime and aeronautical markets." *Flexibility NPRM* at ¶ 1.

effectively and efficiently uses L-Band frequencies. In addition, Inmarsat's network provides vital safety and distress services to ships and airplanes throughout the world.

1. Maritime Services

Inmarsat's network serves a variety of users at sea, including the United States Navy, the United States Coast Guard, merchant vessels, passenger ships, fishing fleets and oil drilling platforms. In most every part of the world, these end users are able to access a wide range of data and voice applications.

Individuals on ships and oil platforms are able to make voice calls, access the Internet and receive vital information from shore, including weather reports, emergency bulletins, electronic chart updates and electronic newspapers. Moreover, ships are able to use Inmarsat's services for ship management applications that are critical to the safe operation of the vessels and to continuing environmental protection. Inmarsat's services can also be used in conjunction with global positioning systems to provide highly accurate position reporting. This service is not only vital for naval and shipping coordination, but also can be used for various commercial purposes, such as the monitoring of fishing catches. Inmarsat services are also available on most U.S. Navy ships around the world. Using the satellite terminals, members of the Navy are able to call home to family and friends while engaged in conflicts in foreign waters, and without waiting until their ship returns to port.

2. Land Based Services

Inmarsat also offers high-speed data and voice services to land-based users around the world. Typical land-based users include media organizations, aid organizations, construction companies and energy and mining interests. The high level of mobility afforded by Inmarsat terminals allows them to be used virtually anywhere.

Anyone living in urban or rural areas or traveling to remote locations is assured of reliable communications services through Inmarsat's network. Companies such as CNN, NPR, the BBC, and Reuters use Inmarsat's satellites to transmit live broadcast-quality voice and store-and-forward video footage. Most recently, CNN has been using small, highly-mobile Inmarsat terminals to broadcast reports from Pakistan on the current war in Afghanistan. These capabilities are facilitating a revolution in real-time news reporting from remote locations.[7] Moreover, aid organizations such as UNICEF, the Red Cross, and Médecins Sans Frontières (Doctors without Borders) use Inmarsat's services for voice and data communications from various locations around the globe. Inmarsat also supports Télécoms Sans Frontières (Telecom without Borders), which sends volunteers with Inmarsat terminals into disaster and refugee areas to enable victims and rescue and aid workers to communicate with the rest of the world.

Numerous corporations and governments also use Inmarsat's services for video conferencing, monitoring of transportation fleets, precision farming, and remote operation of facilities, such as lighthouses and oil pipelines. For example, John Deere uses Inmarsat's service in Canada, Mexico and South America in certain of its products to support advanced farming techniques.

Inmarsat's land-based service also provides a means of communication that is largely immune to natural and man-made disasters. When landlines and cellular service are disrupted by natural disaster or civil disturbances, Inmarsat's service provides governments, aid organizations and commercial and residential users with the means to send and receive vital information necessary to address the situation. Thus, Inmarsat provides critical "backup" network functions when terrestrial networks fail.

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7 *See* Paul Farhi, *Getting the Story Out*, Washington Post at C1 (Oct. 8, 2001); *see also* Michael Grotticelli, *CNN phones in from hot spots*, Broadcast and Cable (Sept. 24, 2001).

3. Aeronautical Services

Inmarsat also offers communication services to commercial, private business and government airplanes, including those of the United States government, almost all major airlines (including United Airlines, Delta, US Airways, American Airlines and British Airways) and various multinational corporations. The service is used for a variety of purposes including air traffic control, automatic reporting of an aircraft's position, coordinating revisions of flight plans, and the transmission of weather and ground conditions. In addition, Inmarsat's service can be used to provide passengers with voice, fax, and data communications, and live news and video feeds.

4. Safety Services

Reliable satellite communications to ships commenced in 1976 with Comsat's Marisat system. Using the Marisat system, with some modifications, and leased space segment capacity from the European Space Agency and Intelsat, Inmarsat started operations in 1982 providing maritime communications, including safety services. After changes to the Safety of Life at Sea ("SOLAS") Convention in 1988, the Global Maritime Distress and Safety System ("GMDSS") began in February 1992 and marked the beginning of a transition from a terrestrially based system for ships in distress at sea to one based mainly on satellite communications. Where, under the old system, ships primarily sought help from other ships in the area, under GMDSS, maritime vessels are able to use a satellite link to contact shore-based search and rescue authorities. In addition, satellite communication in connection with global positioning system ("GPS") technology allows a vessel to broadcast its precise location to Coast Guard ships and nearby vessels, thereby speeding rescue efforts.

Inmarsat offers satellite communications services that cover almost the entire globe and provide the necessary bandwidth for priority instant distress and safety

communications. Certain Inmarsat service offerings are recognized by the International Maritime Organization ("IMO") as being qualified to be used as part of the GMDSS. Any satellite system is able to provide satellite communications services for GMDSS if it complies with the stringent IMO standards, but Inmarsat is the only satellite system that is currently so qualified. The SOLAS Convention of 1974 (as amended from time to time), to which the United States is a signatory, requires all cargo ships of 300 tons gross or more, and all passenger ship traversing international waters, to maintain an Inmarsat terminal on board. The terminals can be used to send or receive hydrographic, meteorological, and maritime safety information messages to and from shore-based facilities, as well as public correspondence.

In the case of a distress call, coast guard services, including the U.S. Coast Guard, can be dispatched on rescue missions. The rescue ships are then able to keep in contact with both the distressed vessel and their base stations throughout the mission using Inmarsat's system. Inmarsat's system provides maritime vessels around the world with the knowledge and advanced warnings necessary to avoid disaster and a means of reliably summoning assistance when needed.

In regard to aeronautical safety, Inmarsat is currently the only satellite communications provider to have met the International Civil Aviation Organization ("ICAO") standards for the provision of aeronautical safety services, such as air traffic management and air traffic operational control.[8] All the major U.S. airlines use Inmarsat's services on transoceanic flights, and the Federal Aviation Administration has been using Inmarsat's network to communicate with flights on certain routes since 1996. Most recently, in 2001, aircraft position reporting via Inmarsat has been introduced in North Atlantic airspace. This program allows air

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[8] While the ICAO will certify other MSS providers as compliant, at this time no other provider has met its standards.

traffic controllers in Canada, Iceland and the United Kingdom to set up contacts with aircraft via datalink to report their position and receive weather information. In the event of a distress situation, or where other forms of communication fail, Inmarsat's system can be used to direct planes to safety and send assistance when needed.

C. Inmarsat's Services In The United States

Inmarsat has long been used to provide land-mobile services in the U.S. to address emergency or other short-term communications needs.[9] Recognizing the potential benefits of Inmarsat's system, several U.S. corporations filed applications with the Commission to utilize Inmarsat's satellite system more broadly for U.S. services, including (i) commercial aeronautical services, such as voice, data and entertainment communications for passengers in-flight, (ii) the Federal Aviation Administration's Wide Area Augmentation System, which will enable safe landings in low-visibility and other navigation benefits, (iii) advanced farming equipment, and (iv) land-mobile services.

On October 9, 2001, the Commission authorized those companies to utilize Inmarsat's network in the United States for the first time.[10] Inmarsat plans to work closely with its service providers to facilitate the prompt commencement of these valuable services, and Inmarsat's new broadband offerings, for the benefit of consumers throughout the United States.

D. Inmarsat's Bandwidth Needs Are Growing

Inmarsat is pleased that the Commission has approved the use of the Inmarsat system to serve the United States. This decision will open the door for many new services to be offered to U.S. businesses and consumers. In all likelihood, these new services will result in a need for Inmarsat to access more L-Band spectrum over North America.

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9 *See, e.g., American Mobile Satellite Corporation, et al.*, 7 FCC Rcd. 942 (1992).

10 *See Inmarsat Authorization.*

Inmarsat's need for additional L-Band spectrum is driven mainly by growth in traffic. For example, from 1999 to 2000, data circuit minutes on the Inmarsat system have grown from 49 million to 59 million, and packet data in kilobits has grown from 180 million to 209 million. Moreover, additional bandwidth is needed to support the increasing demand for higher data transmission speeds and new broadband services.

Inmarsat's subscriber base continues to grow as new product lines are developed. This results in higher demands on existing spacecraft, and the need to replace existing spacecraft with higher-capacity networks, such as the Inmarsat-4 system. In addition, the communications requirements of end users are constantly increasing, as they develop applications that require higher data rates.

While higher data rates can demand more bandwidth, Inmarsat has employed a number of measures that have allowed Inmarsat to increase its efficiency and to operate with virtually the same amount of spectrum for the past two years, despite substantial growth in the number of Inmarsat terminals. Inmarsat continues to select and develop modulation and coding methods that improve spectrum efficiency (e.g. 16-QAM modulation for 144 and 432 kbps services). Many of its terminals have antenna diameters of the order of one meter, including Inmarsat-A[11] and Inmarsat-B, which allows frequency reuse between the global beams of satellites widely separated in the geostationary orbit (this is not possible with typical equipment provided by Motient and other regional MSS systems). The radio-frequency carriers of these two standards and others are also interleaved to make sure no spectrum is left unused. Other efficiencies come from the reuse of spectrum among the beams of the Inmarsat-3 satellites in a

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[11] The Inmarsat-A terminal type was first put into maritime service in 1976, and some are still in service on ships today, since some ship owners are reluctant to change to newer technology terminals. Inmarsat-A is being phased out as ship owners change and as ships are scrapped.

globally optimized pattern. But these techniques go only so far, and the continuing growth in the number of terminals and the increase in demand for higher-rate data services remain the main drivers behind the increasing need for L-Band MSS spectrum.

Inmarsat's commercial success and broad service offerings stand in stark contrast to the unsubstantiated assertions that terrestrial operations are necessary (i) to ensure the commercial viability of MSS systems, and (ii) to support the Commission's goal of bringing services to rural and underserved communities.[12] Inmarsat's experience over the past twenty years demonstrates that MSS businesses are viable if run efficiently and targeted to the appropriate markets. Inmarsat has built its business by providing the essential business services described above, and not by trying to compete with cellular and PCS operators. The result is a company providing services to targeted markets, including safety services for the maritime and aeronautical industries, with an annual revenue of over $400 million. With the recent authorization from the Commission, Inmarsat stands ready to expand its operations in the U.S. market and to address the needs of the rural and other underserved communities. As discussed below, however, opening of the L-Band to terrestrial uses would result in unacceptable interference into Inmarsat's existing network and future services in the United States, and constrain the growth of the Inmarsat system.

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12 *See Flexibility NPRM* at ¶ 25.

II. TERRESTRIAL USE OF THE L-BAND WOULD CAUSE UNACCEPTABLE INTERFERENCE TO INMARSAT

A. Interference Analysis

In response to the Commission's inquiry, Inmarsat has commissioned the study in the attached Technical Annex that demonstrates that the terrestrial services proposed at L-Band would create five main interference problems:[13]

- The in-band signals of Motient's terrestrial mobile terminals would cause unacceptable interference to the signals being received by the Inmarsat satellites (Section 3.1 of the Technical Annex);
- The out-of-band emissions from Motient's terrestrial mobile terminals would cause unacceptable interference to the signals being received by the Inmarsat satellites (Section 3.2 of the Technical Annex);
- Terrestrial base stations' in-band signals would create unacceptable interference into the receivers of nearby Inmarsat mobile terminals (Section 3.3 of the Technical Annex);
- Terrestrial base stations' out-of-band emissions would create unacceptable interference into the receivers of nearby Inmarsat mobile terminals (Section 3.4 of the Technical Annex); and
- Motient's terrestrial uses would degrade the performance of its own space-based services and reduce the traffic-carrying capacity of the Motient space segment, thereby increasing Motient's need for L-Band spectrum (Section 3.5 of the Technical Annex).

These problems will exacerbate the shortage of the critical L-Band spectrum resource and are described in greater detail below.

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[13] *See Flexibility NPRM* at ¶ 26. Certain terrestrial service providers have supported the opening of the L-Band for terrestrial use, but Motient has offered the only specific proposal as to how terrestrial service would be offered in the band. The Commission has requested comments specifically on Motient's Application. *See id.* at ¶ 29. Inmarsat, therefore, has focused its technical analysis on Motient's proposed use of the L-Band. However, the problems presented by a "pure" terrestrial use of a portion of the L-Band are largely the same.

1. Interference From In-Band Operations Of Motient's Terrestrial Mobile Terminals Into Inmarsat Satellite Receivers

Because of L-band spectrum scarcity, Motient uses within the United States the same L-Band channels as Inmarsat uses outside the U.S. (currently in areas such as Europe and South America in the case of the Inmarsat-3 satellites). Generally, spectrum cannot be reused in the same geographic location by different MSS systems because the mobile satellite terminal antenna is so small (except Inmarsat-A and Inmarsat–B terminals with 'big' antennas) that it cannot differentiate between the different satellites, even if they are in widely-separated orbital locations. Through the use of spot beams, however, MSS providers have reused spectrum in geographically distinct locations. As a result, the 'up-link' signals from the mobile satellite terminals of the Motient and Inmarsat systems use the same channels when communicating with their respective satellite systems from different geographic locations. Motient proposes to use the same frequency bands for its proposed terrestrial mobile terminals in the U.S. as it uses for its satellite mobile terminals.

As discussed in detail in the Technical Annex, in-band signals of the proposed Motient terrestrial mobile terminals operating within the United States would cause unacceptable interference, on a co-channel basis, into Inmarsat's satellite receivers.[14] Motient's proposed terrestrial system supports far greater numbers of co-channel carriers, and therefore far greater numbers of potential interfering signals, than Motient's satellite system. Motient has proposed to limit the terrestrial reuse of carriers by a factor of nine thousand in certain frequency bands, but has proposed no such limit in other portions of the L-Band.[15] Motient further suggests that this

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[14] Technical Annex at Section 3.1.

[15] *See Motient Ex Parte Presentation*, File No. SAT-ASG-20010302-00017, et al. (filed July 25, 2001).

terrestrial network will support millions of subscriber terminals.[16] Thus, this "ancillary" terrestrial system is designed to operate with a far greater number of co-channel carriers, and to support a far greater number of end-users, than the current Motient satellite system.[17]

2. Interference From Out-of-Band Emissions Of Motient's Terrestrial Mobile Terminals Into Inmarsat Satellite Receivers

Another source of unacceptable interference into Inmarsat's satellite receivers are the aggregate out-of-band emissions produced by the Motient terrestrial mobile terminals.[18] Unlike the problem described in the previous section, this problem is not one of co-channel interference. This is an interference problem to which each and every Motient mobile terminal would contribute when it operates within a given Inmarsat receive beam and is transmitting to a Motient terrestrial base station. Considering that the smallest Inmarsat receive beam would cover the entire eastern corridor from New York to Washington, D.C. (an area with a population of over 33 million people),[19] it is conceivable that tens of thousands of Motient mobile terminals could be operating at once in this large area, and producing unacceptable levels of interference into Inmarsat's operations over the United States.

3. In-Band Signal Interference From Motient's Terrestrial Base Stations Into Inmarsat Mobile Terminals

As the Commission is aware, ITU Radio Regulations reserve the L-Band worldwide almost exclusively for MSS service. Based on these international allocations, Inmarsat designed its mobile terminals to operate efficiently and effectively in the presence of

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16 *Application*, Appendix A at 37.

17 *Id.* (noting that Motient's current authorization covers 200,000 mobile satellite terminals).

18 *See* Technical Annex at Section 3.2.

19 The New York-Northern New Jersey-Long Island, Philadelphia-Wilmington-Atlantic City, and Washington-Baltimore Consolidated Metropolitan Statistical Areas (CMSAs) alone contained over 33 million people in 1998. U.S. Census Bureau, *Statistical Abstract of the United States, The National Data Book* at 33-35 (120th ed. 2000).

other satellite services. Broad deployment of terrestrial transmitters operating in the L-Band, however, would create significant new issues that Inmarsat did not and could not have been expected to anticipate.

As explained in the Technical Annex, if Motient were allowed to operate terrestrial base stations in the U.S., the high power emissions from such stations in an immediately adjacent frequency would "overload" Inmarsat's mobile terminals that are operating in the same area.[20] Depending on the proximity to a base station and the level of interference, Inmarsat's terminals would suffer a reduction in sensitivity and possibly fail to operate altogether. In urban areas, Inmarsat users would suffer terminal "overload" within 1000 meters or more of Motient's base stations and, in suburban and rural areas, terminals would similarly suffer if located within 10,000 meters or more.

The interference suffered by aeronautical mobile terminal users would be even greater than that experienced by land-based users because of the clear line-of-sight path between the Motient interfering base station and the aircraft. Based on Inmarsat's technical analysis, under the most likely conditions, airborne terminals could suffer overload failures as far as 22 miles away from a base station while flying below 2,500 meters.[21]

4. Out-Of-Band Emission Interference From Motient's Terrestrial Base Stations Into Inmarsat Mobile Terminals

A separate problem is that the out-of-band signals from Motient's base stations that fall directly in the receive band of a nearby Inmarsat mobile terminal would cause unacceptable interference into the Inmarsat terminal whether it is on the ground or in an aircraft.[22] Motient's own satellite system would not suffer in the same way as Inmarsat (and

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20 *See* Technical Annex at Section 3.3.

21 *See* Technical Annex at Section 3.3.2.

22 *See* Technical Annex at 3.4.

other MSS operators) from unacceptably high out-of-band emissions from the Motient base station transmitters. If a Motient terrestrial base station interfered with a Motient mobile earth station ("MES") receiver, and thereby blocked use of the satellite link, Motient could use a nearby terrestrial base station to provide service to its user. Thus, the interference caused by Motient's own terrestrial network could cause the need for its customer to use Motient's terrestrial network, instead of its satellite network. For this reason, Motient would have no incentive to reduce its out-of-band emissions to achieve the necessary interference protection levels for Inmarsat mobile terminals.

5. Interference From Motient's Terrestrial Uses Would Increase Motient's Need For L-Band Spectrum.

The in-band signals of Motient's terrestrial transmitters would cause co-channel interference into Motient's satellite receivers that are covering an adjacent geographic area, just as they will cause co-channel interference into Inmarsat's satellite receivers. This is not just Motient's concern -- it affects Inmarsat as well. As set forth in the Technical Annex, the self-interference generated by the Motient terrestrial transmitters will reduce the traffic-carrying capacity of the Motient space segment.[23] Thus, to maintain the same level of capacity that is possible in a satellite-only configuration, Motient would need to seek access to more L-Band spectrum. In sum, Motient's terrestrial uses would degrade the performance of its own space-based services, thereby increasing Motient's need for L-Band spectrum, and placing greater demands on the already scarce L-Band.

These four interference scenarios create serious technical, legal and policy problems that are addressed in the following subsections.

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[23] *See* Technical Annex at Section 3.5.

B. Vital Safety Services Will Be Threatened If Terrestrial Services Are Offered In The L-Band

As discussed above, the L-Band and nearby spectrum designated for GPS service provide the bandwidth for services that are vital to the safety of those at sea and in the air. Motient's proposed terrestrial components threaten these safety services both within and outside the United States. Airplanes relying on Inmarsat terminals, either by design or through the failure of alternative communications systems, would face "overload" problems and unacceptable levels of unwanted emissions while flying near Motient base stations. In an emergency, pilots may not be able to receive necessary instructions from air traffic controllers, thereby jeopardizing the passengers and crew.

Similarly, maritime distress communications may be affected by Motient's proposed terrestrial uses. Interference from Motient's terrestrial network threatens the reliability of communications between ships and shore. Emergency signals from ships at sea may be blocked or need to be repeated, thereby delaying rescue efforts.

Finally, situated immediately above the L-Band MSS downlink band are the frequencies designated for GPS systems. Airplanes, ships and land vehicles use GPS for navigational purposes and their reliance upon such systems has been increasing over the years.[24] Terrestrial base-stations, such as the ones proposed by Motient, could interfere with GPS receivers, thereby undermining their operation generally and the safety of air traffic in particular. The U.S. Department of Transportation has identified that "[h]andheld MSS Mobile Earth Stations (MESs), transmitting in the 1610-1660.5 MHz band, can introduce wideband power in

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[24] *See Vulnerability Assessment of the Transportation Infrastructure Relying on the Global Positions System, Final Report*, John A. Volpe National Transportation Systems Center for the U.S. Department of Transportation (August 29, 2001) (the "*GPS Report*").

the GPS band, raising the noise level."[25] Although standards have been agreed with the NTIA limiting the emissions from MES in the GPS band, Motient's proposed terrestrial network, with millions of terrestrial mobile handsets and numerous terrestrial base stations, raises a significant threat of increased interference to GPS systems.

C. Terrestrial Uses Violate The United States' ITU Obligations

As a matter of international law, the United States should not allow terrestrial services to be provided in the L-Band, as proposed, because doing so would cause unacceptable interference to the operation of Inmarsat's satellite network and other MSS systems, such as the systems of Mexico (Solidaridad), the Russian Federation (Volna and More) and Japan (MTSAT). The ITU Table of Frequency Allocations does not provide any primary allocations for terrestrial services in the United States at L-Band. The United States is free not to follow the ITU Table within its borders, but only as long as those other uses do not cause interference outside of the United States.[26]

As set forth in the Technical Annex, the proposed Motient terrestrial service would cause interference into the operation of the Inmarsat system (and the other MSS systems) outside the borders of the United States. Thus, consistent with its obligations under the ITU, the United States may not authorize this service.

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25 *GPS Report* at 27.

26 *See* ITU Radio Regulations, Article S4, Section S4.4; Article S8, Section S8.5. Motient does not dispute this fact. *See Consolidated Opposition To Petitions To Deny And Reply To Comments of Motient Services, Inc., et al.* at 12-13, File No. SAT-ASG-20010302-00017, et al. (filed May 7, 2001) ("*Motient Consolidated Opposition*") ("[The U.S.] is obligated by treaty to allocate spectrum in a manner that is consistent with this international allocation and does not cause harmful interference to other users. In light of the harmful interference that would be caused by terrestrial-only operations, the terrestrial wireless industry's proposal to allocate the L-band to terrestrial use would cause the United States to violate its treaty obligations." (footnote omitted)).