BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
O3b Limited	)	
	)	File No. ________________
Application to Operate a Gateway Earth Station with a Non-U.S. Licensed Non-Geostationary Orbit Ka-band Space Station System	)	Call Sign ______

U.S. MARKET ACCESS APPLICATION

In accordance with Section 25.137 of the Commission's rules, 47 C.F.R. § 25.137, O3b Limited hereby requests authority to operate a gateway earth station in Haleiwa, Hawaii with a non-U.S. licensed, non-geostationary orbit ("NGSO") Ka-band space station system serving the United States market.[1]

I. BACKGROUND

O3b stands for the "other three billion." The name is perfectly descriptive because the O3b satellite system focuses on those regions of the planet where large populations live, work and play but where there is little or no terrestrial infrastructure that can make the Internet accessible and affordable to them. O3b's next-generation network will combine the reach of satellite with the speed of fiber to enable emerging market

---

[1] O3b Limited is a wholly-owned subsidiary of O3b Networks Limited. O3b Limited and O3b Networks Limited are both Jersey, Channel Islands companies. References to O3b herein include O3b Limited and its affiliates as appropriate.

telecommunications operators ("telcos") and Internet service providers ("ISPs") to make Internet access a reality for these "other three billion" people.

Founded in 2007, O3b quickly gained the financial and operational backing of such world-class companies as SES, Google, Liberty Global, HSBC and others. Moreover, in September 2009, the French Credit Export Agency, Coface, agreed to support a $465 million buyer credit facility in favor of O3b, which further strengthened O3b's financial position. O3b is headquartered in St. John, Jersey, Channel Islands, which is a British Crown Dependency. As such, O3b has relied upon the United Kingdom telecommunications regulatory authority, Ofcom, as its notifying administration with the International Telecommunications Union ("ITU").

II. GRANT OF THIS APPLICATION WILL SERVE THE PUBLIC INTEREST BY BRINGING AFFORDABLE INTERNET ACCESS TO VAST NEW POPULATIONS AROUND THE GLOBE

Grant of this application will serve the public interest, convenience, and necessity by allowing O3b to accomplish its mission of making the Internet available to the other three billion people around the world who currently have limited or no access to this transformative technology. While the focus of O3b's system is to reach over 100 emerging market countries in Central and South America, Africa, the Middle East, Asia, and Australia, it is also capable of serving mature markets like the U.S.

The O3b vision is quickly becoming a reality. On November 7, 2008, the company signed a contract with Thales Alenia Space to build its NGSO system. Work under the satellite manufacturing contract has already commenced, and the first O3b satellites are scheduled to be launched out of French Guyana in 2012. Moreover, as an indication of the strong demand for capacity on the O3b system, the company has accrued a backlog of approximately $600M in service contracts from telcos and ISPs, which will allow O3b to be profitable – and therefore sustainable – at service commencement. In short, O3b's mission of bringing the Internet to vast populations who are currently underserved will be accomplished in the very near future.

O3b's unique system architecture will allow the over one billion people living in Central and Southern Africa to gain a first chance to research for themselves answers to pressing medical questions or to start an on-line business, or perhaps communicate via email or VOIP to friends and family living in the U.S. or other industrialized nations. Likewise, O3b will provide the infrastructure necessary for ISPs to extend service offerings to the hundreds of millions of people living in South America in order to allow more people in this region to engage in Internet commerce, express their political views to a wider audience, or to better their education. This story will continue to unfold throughout a wide equatorial band around the globe as more and more ISPs are able to extend Internet connectivity at a reasonable price to individuals, companies, governments, hospitals, and other community institutions. Accordingly, favorable and expeditious Commission action on this earth station application will serve the public interest by opening new markets for U.S. businesses, expanding the communications capabilities for Americans traveling abroad, and increasing competition for the provision of satellite services around the globe, all while providing a critical first link to the Internet for billions of people on our planet.

III. THE O3b SYSTEM

A. O3b Space Segment

The O3b satellite system will consist of eight satellites in medium earth orbit at 8,062 km above the Equator. As demand for O3b services grows, O3b may seek to deploy additional satellites into the same orbit. Each satellite will have 12 steerable spot beams that track the position of O3b gateways and customer locations on the earth as the satellite travels along its orbit. Each satellite will operate on 20 wideband channels of 216 MHz each, ten of which will typically be used (in the normal operating configuration) for links from gateways to customer earth stations and ten for links from customer earth stations to gateways.[2] These interconnected spot beams will provide critical "middle mile" connectivity between ISPs or telcos and the Internet backbone (or, in some cases, cell phone towers so that O3b customers can connect to the public switched telephone network). This innovative design ensures that system bandwidth is focused on where it is required by customers. The O3b satellite system is more fully described in the Schedule S and *Technical Attachment* accompanying this application.

B. O3b Ground Segment

The O3b system will be supported by a network of gateways built at locations around the world with good connectivity/access to the Internet backbone. At least four of these gateways will also serve as telemetry, tracking and command ("TT&C") stations for the satellite networks. The instant application is for one such combined gateway/TT&C station to be located in Haleiwa, Hawaii, which will need to be constructed prior to the launch of the system. The O3b Hawaii gateway will consist of two 7.3 meter antennas that will continuously track two visible in-orbit O3b satellites, and a third 7.3 meter

---

[2] *See* Attachment A, *Technical Information to Supplement Schedule S*, at 2 and Appendix A thereto for more information about O3b spacecraft reconfigurability (the "*Technical Attachment*").

antenna that will serve as a spare. This gateway will help O3b control its satellites in orbit and serve as the connection point to the Internet backbone for customers in the Pacific region. Additional details about O3b's Hawaii gateway can be found in the Schedule B and *Technical Attachment* accompanying this application. O3b currently plans to deploy a second gateway-only facility in the continental United States and will file an application for such a gateway with the Commission at the appropriate time.

O3b intends initially to provide service to "Tier 1" customers such as ISPs that need "middle mile" Internet connectivity to serve customers not well-served by terrestrial solutions. Such customers will operate two 4.5 meter antennas that will continuously track the visible O3b satellites. O3b also intends to offer a "Tier 2" service targeting cellular backhaul and VSAT network services using smaller antennas. To the extent O3b sells such "Tier 1" or "Tier 2" service to a customer located in the United States, an application for authority to operate such earth stations will be filed with the Commission.[3] O3b will negotiate individual contracts with each of its customers and, therefore, will be a non-common carrier.[4]

C. Frequency Plan

In order to provide the bandwidth required to serve its target customers, the O3b system proposes to operate on the following Ka-band frequencies:

---

[3] As the O3b system evolves, O3b may develop additional service offerings using different sized antennas. To the extent O3b develops such service offerings in the United States, applications for authority to operate the customer earth stations will be filed with the Commission.

[4] *See* 47 C.F.R. § 25.114(d)(11). In addition, while O3b's customers may be connected to the public switched telephone network, O3b itself will not be.

Downlink Frequency	Ka-Band Plan	O3B Proposed Use
17.8-18.3 GHz	FS	Service Links and Gateway Links
18.3-18.6 GHz	GSO FSS down	Service Links and Gateway Links
18.8-19.3 GHz	NGSO FSS down	Service Links, Gateway Links and TT&C[5]
Uplink Frequency	**Ka-Band Plan**	**O3B Proposed Use**
27.6-28.35 GHz	LMDS fss (secondary)	Service Links and Gateway Links
28.35-28.4 GHz	GSO FSS up ngso fss up (secondary)	Service Links and Gateway Links
28.6-29.1 GHz	NGSO FSS up gso fss up (secondary)	Service Links, Gateway Links and TT&C[6]

A more precise description of the channel plan for the O3b system is included in the Schedule S and *Technical Attachment* accompanying this application. O3b recognizes that not all of the frequencies that it proposes to use are allocated in the United States for NGSO fixed satellite service ("FSS") on a primary basis under the U.S. Table of Allocations[7] and the Commission's Ka-Band Plan.[8] Figure 1 below shows O3b's proposed frequency plan in comparison to the Commission's Ka-Band Plan:

---

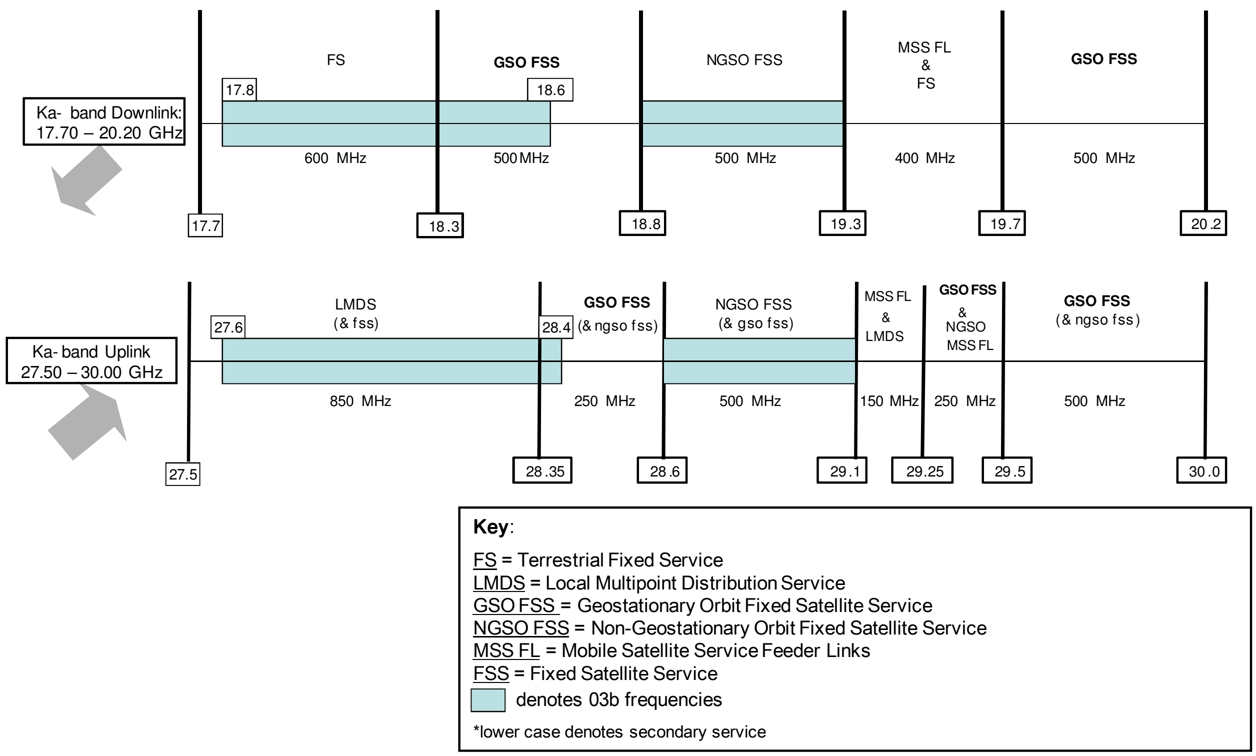
5 O3b will conduct TT&C operations in the band edges just below 19.3 GHz (downlink) and 29.1 GHz (uplink). *See* 47 C.F.R. § 25.202(g).

6 *Id.*

7 *See* 47 C.F.R. § 2.106.

8 The Ka-Band Plan is a combination of the 18 GHz band plan established in IB Docket No. 98-172 , including *In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd 13430, ¶ 28 (2000) and related decisions, and the 28 GHz band plan established in CC Docket No. 92-297, including *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd 19005, ¶ 42 (1996) and related decisions. The 18 GHz band plan and the 28 GHz band plan are collectively referred to herein as the Ka-Band Plan.

Figure 1: O3b Proposed Frequency Plan Compared to the U.S. Ka-Band Plan



For the reasons set out in Section V.B herein, O3b respectfully requests waivers of the Ka-Band Plan and associated rules, as necessary, to allow O3b to use the non-NGSO FSS Ka-band frequencies on a non-conforming basis relative to the allocated services in those bands.

IV. GRANT OF THE O3B EARTH STATION APPLICATION DOES NOT REQUIRE A PROCESSING ROUND BECAUSE ENTRY OF ADDITIONAL KA-BAND NGSO NETWORKS WILL NOT BE PRECLUDED

Under Sections 25.137(c) and 25.157 of the Commission's rules, applications for authority to communicate with a non-U.S.-licensed NGSO-like system (including requests for U.S. market access) are ordinarily processed under a "modified processing round" framework, which uses a band-splitting sharing mechanism to divide spectrum among competing applicants. The Commission, however, has waived the processing round requirement and allowed NGSO systems access to the entire frequency band when doing so "will not preclude additional entry."[9] For the reasons set forth below and in the *Technical Attachment*, O3b respectfully requests a waiver of the processing round and band segmentation requirements in connection with its proposed system.

The O3b satellite system is capable of sharing with future NGSO networks operating in the same frequency bands and, therefore, will not preclude additional entry by future NGSO licensees. First, the entire O3b constellation will occupy a single circular orbit above the Earth's Equator. This enables an angular separation to be maintained between O3b communications links and the links of other NGSO systems using different orbits (e.g., highly elliptical orbits). Second, the O3b satellite system uses a combination of multiple tracking antennas and satellite diversity to avoid interference from its system into other NGSO systems and from other NGSO systems into O3b. As noted above, earth stations that are part of the O3b system will have a minimum of two directional antennas that each track a separate O3b satellite that is visible in the sky. This further enables the use of angular discrimination to facilitate spectrum sharing, while providing a mechanism for interference avoidance in the rare event that an O3b earth station is pointed at an O3b satellite that is in-line with a satellite of another NGSO system. In such an event, interference can be avoided by either the O3b earth station switching to its other antenna pointed at a different satellite or the other affected NGSO system employing a similar

---

[9] *Northrop Grumman Space & Missions Systems Corporation*, 24 FCC Rcd 2330, at ¶¶ 29, 34 (Int'l Bur. 2009) ("*Northrop Grumman*"). *See also Space Imaging, LLC*, 20 FCC Rcd 11964, ¶ ¶ 10, 11 (Int'l Bur., 2005) ("*Space Imaging*"); *Lockheed Martin Corporation*, 20 FCC Rcd 11023, ¶ 15 (Int'l Bur., 2005); and *Digital Globe, Inc.*, 20 FCC Rcd 15696, ¶ 8 (Int'l Bur., 2005) ("*Digital Globe*").

mechanism.[10] The *Technical Attachment* provides additional information on O3b's ability to share spectrum with future NGSO systems.[11]

On this basis, the Commission should waive the processing round and band-splitting requirements in Sections 25.137(c) and 25.157, and instead process the O3b earth station application on a first-come, first-served basis in each of the Ka-band segments in which O3b seeks to operate.[12] The Commission has previously waived such requirements for NGSO systems in the Earth Exploration Satellite Service that employ tracking antennas to provide discrimination between the target satellite and potentially interfering satellites.[13] The Commission has also waived such requirements for NGSO systems in the Ka-band FSS when the applicant employs "a mechanism designed to permit multiple NGSO systems to operate in the same spectrum by limiting the number of in-line interference events between NGSO systems…"[14] In this case, O3b employs both techniques to enable sharing with future NGSO systems.

---

[10] Theoretically, there may be extremely rare cases when satellite switching is not possible for earth stations at the highest latitudes within the O3b network coverage. In such extremely rare cases (and assuming that the other affected NGSO network cannot employ satellite switching or some other mechanism to avoid an in-line interference event with O3b), O3b will employ the default procedure for avoidance of in-line interference events set forth in Section 25.261 of the Commission's rules. 47 C.F.R. § 25.261(c). To the extent necessary, O3b also requests a waiver of Section 25.261 of the Commission's rules (which technically applies only to the 18.8-19.3 GHz and 28.6-29.1 GHz frequencies). The interference avoidance methods employed by O3b achieve the same result as the default method in Section 25.261 for all of the proposed O3b frequencies, but without the need to divide spectrum (except in the extremely rare circumstances described in this footnote, in which case O3b will employ the default sharing method).

[11] *See Technical Attachment* at A.10.2.

[12] In accordance with Section 25.137(c) of the Commission's rules, the O3b earth station application is ripe for grant because its non-U.S. licensed satellite network has been submitted for coordination to the ITU and has been authorized by the United Kingdom. 47 C.F.R. § 25.137(c). *See Letter from Stephen Limb, International Frequency Co-ordination, Ofcom, to Greg Wyler, O3b Networks Limited,* dated September 10, 2009, attached hereto as Attachment B (*"Ofcom Letter*").

[13] *See Space Imaging* at ¶¶ 10, 11 and *Digital Globe* at ¶ 8.

[14] *Northrop Grumman* at § 33.

The Commission may waive a rule for good cause shown.[15] A waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the rule.[16] Generally, the Commission may grant a waiver of a rule if the relief requested would not undermine the policy objective of the rule and would otherwise serve the public interest.[17] As explained above, waiver of Sections 25.137(c), 25.157 and 25.261 in this case will not undermine the policy objective of those rules – to prevent earlier authorized NGSO FSS systems from precluding later filed systems from operating – and will further the public interest by allowing O3b to provide service far sooner than would strict adherence to the rule.

V. THE O3B EARTH STATION APPLICATION SATISFIES THE COMMISSION'S CRITERIA FOR UNITED STATES MARKET ACCESS

In the *DISCO II Order*, the Commission established two procedures by which a non-U.S. licensed satellite operator can seek authorization to provide service in the United States.[18] In the procedure relevant for O3b, a company seeking to communicate with a non-U.S. space station may file an application for an initial earth station license, listing the non-U.S. space station as a "point of communication," and demonstrating that the space station meets all applicable Commission requirements.[19] In reviewing such an earth

---

[15] 47 C.F.R. § 1.3. *See also WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969) ("*WAIT Radio*"); *Northeast Cellular Telephone Co. v. FCC,* 897 F.2d 1164, 1166 (D.C. Cir. 1990) ("*Northeast Cellular*").

[16] *See Northeast Cellular*, 897 F.2d at 1166.

[17] *See WAIT Radio*, 418 F.2d at 1157.

[18] *See Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States*, 12 FCC Rcd 24094, ¶ 188 (1997) ("*DISCO II Order*"). *See also Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States*, 15 FCC Rcd 7207, ¶ 5 (1999) ("*DISCO II Recon Order*"); 47 C.F.R. § 25.137.

[19] *See DISCO II Recon Order* at ¶ 5.

station application, the Commission considers the effect on competition in the United States, spectrum availability, eligibility and operational requirements, and concerns related to national security, law enforcement, foreign policy, and trade.[20]

As discussed in detail below, O3b satisfies the criteria for obtaining U.S. market access for its Hawaii earth station to communicate with the O3b satellite system, subject to certain waivers described herein.

A. Effect on Competition in the United States

Where a non-U.S. satellite licensed by a World Trade Organization ("WTO") member country seeks authority to provide a satellite service covered by the WTO Basic Telecommunications Agreement ("WTO Agreement"), the Commission presumes that foreign entry will promote competition in the United States.[21] As noted above, O3b has relied upon the United Kingdom telecommunications regulatory authority, Ofcom, as its notifying administration with the ITU.[22] The United Kingdom is a member of the WTO.[23] O3b also seeks authority to provide only those satellite services covered by the WTO Agreement.[24] Thus, O3b is entitled to a presumption that entry of its service will promote

---

[20] *DISCO II Order* at ¶ 29.

[21] *Id.*

[22] As the Commission has recognized, the United Kingdom does not issue satellite licenses per se. Rather, Ofcom requires a prospective satellite operator to demonstrate it is technically, legally, and financially qualified to implement its proposed system in accordance with the schedule in its business plan and to submit information required to begin the international coordination process under the auspices of the ITU. *See, e.g., Pacific Century Group*, 16 FCC Rcd 14356, ¶ 16, note 37 (2001). O3b has complied with these requirements in the United Kingdom. *See Ofcom Letter*.

[23] As noted above, O3b is headquartered in St. John, Jersey, Channel Islands, which is a British Crown Dependency. The Commission treats British Crown Dependencies like Jersey and Guernsey as members of the WTO. *See, e.g., Intelsat Holdings, Ltd., Transferor, and Serafina Holdings Limited, Transferee, Consolidated Application for Consent to Transfer Control of Holders of Title II and Title III Authorizations*, 22 FCC Rcd 22151, ¶ 25, fn. 57 (2007).

[24] O3b does not seek authority to provide direct-to-home, Digital Audio Radio Service, or Direct Broadcast Satellite Service in the United States.

competition in the United States and need not make an effective competitive opportunities showing.[25]

B. Spectrum Availability

The Commission also considers spectrum availability as a factor in determining whether to allow a foreign-licensed satellite to serve the U.S. market.[26] In doing so, the Commission evaluates whether grant of access would create the potential for harmful interference with U.S.- licensed satellite and terrestrial systems.

The 18.8-19.3 GHz (Downlink) and 28.6-29.1 GHz (Uplink) NGSO FSS Bands. These frequency bands are allocated on a primary basis to NGSO FSS. O3b's proposed use of these frequencies will not cause harmful interference to any U.S. licensed commercial NGSO FSS Ka-band system in the portion of the Ka-band allocated on a primary basis to NGSO FSS because – at present – there are none. Moreover, as noted above, the O3b satellite system is capable of sharing use of the requested frequencies with future co-frequency NGSO systems. Thus, future NGSO FSS Ka-band networks serving U.S. markets that are authorized and deployed can co-exist with the O3b satellite system.

The 18.3-18.6 GHz (Downlink) GSO FSS Band. This frequency band is allocated in the U.S. on a primary basis to GSO FSS. Because the 18.3-18.6 GHz downlink band is not allocated to NGSO FSS even on a secondary basis, O3b proposes to use this band on a non-conforming basis – *i.e.*, on a non-harmful interference, non-protected basis relative to any service allocated in that band – and respectfully requests a waiver of the Ka-Band Plan and Section 2.106 (footnote NG 164) of the Commission's rules to permit such use.

---

[25] *See* 47 C.F.R. § 25.137(a)(2).

[26] *See DISCO II Order*, at ¶¶ 149-50.

The Commission has allowed similar non-conforming use of FSS frequencies in the Ka-band downlink allocated to GSO on a primary basis where applicants are prepared to accept interference from and can demonstrate that their proposed operations are not likely to cause harmful interference to primary operations.[27] As a non-conforming user of the 18.3-18.6 GHz downlink band in the United States, O3b makes no claim of protection from interference from U.S.-licensed GSO FSS networks in this band. In the 18.3-18.6 GHz downlink band, the ITU has developed downlink equivalent power flux density ("$EPFD_{down}$") limits to protect GSO FSS networks from unacceptable interference from NGSO FSS systems operating in the same frequencies.[28] Specifically, in accordance with Article 22 of the ITU Radio Regulations, if the applicable $EPFD_{down}$ limits are met, the NGSO FSS satellite system is considered to have met its obligations to protect GSO FSS networks from unacceptable interference. In this case, as demonstrated in the *Technical Attachment*, the O3b system will meet the applicable ITU $EPFD_{down}$ limits in all frequency ranges where these limits apply and which overlap those used by the O3b system (*i.e.*, 17.8-18.6 GHz).[29] As a result, co-coverage GSO FSS networks will not experience unacceptable interference in the 18.3-18.6 GHz band.[30] In any event, O3b confirms that its operations will be on a non-protected, non-harmful interference basis relative to U.S.-licensed GSO FSS networks in the same band.

---

[27] *See Northrop Grumman* at ¶¶ 74-75 and *In the Matter of contactMEO Communications, LLC*, 21 FCC Rcd 4035, at ¶¶ 25-26, (Int'l Bur., 2006) ("*contactMEO*").

[28] *See* ITU Radio Regulations, Article 22. *See also Technical Attachment* at A.10.1 for a discussion of O3b's compliance with the operational limits in Article 22.

[29] *See Technical Attachment* at A.10.1.

[30] Unacceptable interference, which derives from the definition of "accepted interference", is considered to be a lower level of interference than "harmful interference." *See*, *e.g.*, definitions of these terms in Section 2.1 of the Commission's rules, 47 C.F.R. § 2.1.

In these circumstances, waiver of the Ka-Band Plan and Section 2.106 (footnote NG 164) of the Commission's rules is warranted as the policy objective of the rule will not be undermined, and the public interest will be served by allowing O3b to bring Internet access and other satellite-delivered services to underserved populations across the globe.

O3b notes that there is also a co-primary fixed service ("FS") allocation in the 18.3-18.58 GHz frequency range that is set to expire on the sooner of the date that all incumbent FS licensees are relocated or November 19, 2012.[31] O3b service is scheduled to commence in 2012 and, thus, may overlap for a very brief period with FS licensees in this frequency range. To the extent that O3b does overlap with these FS licensees, O3b will meet the applicable power flux density ("PFD") limits at the earth's surface prescribed by the ITU for the protection of terrestrial services in this band.[32]

The 28.35-28.4 GHz (Uplink) GSO FSS Band. This frequency band is allocated to the GSO FSS on a primary basis and to the NGSO FSS on a secondary basis. O3b proposes to use these frequencies consistent with the secondary allocation for the NGSO FSS in this band, *i.e.*, on a non-harmful interference, non-protected basis relative to U.S.-licensed GSO FSS networks operating in the same frequencies. Given the secondary NGSO FSS allocation, no waiver of the Ka-Band Plan is required for O3b's proposed uplink operation in the 28.35-28.4 GHz band.

The Commission has allowed similar secondary use of frequencies in the Ka-band uplink allocated to GSO FSS on a primary basis where applicants are prepared to accept interference from and can demonstrate that their proposed operations are not likely to

---

31 47 C.F.R. § 101.85(b)(1). There is also a co-primary FS allocation in the 19.26-19.3 GHz range, but this co-primary allocation expires on October 31, 2011, which is long before the first O3b satellite will be launched. *See id.* at § 101.85(b)(2).

32 *See* discussion *infra* at 15-17.

cause harmful interference to primary operations.[33] As a secondary user of the 28.35-28.4 GHz band in the United States, O3b makes no claim of protection from interference from U.S.-licensed GSO FSS networks in this band segment. In the 28.35-28.4 GHz band, the ITU has developed uplink equivalent power flux density limits ("$EPFD_{up}$") limits to protect co-frequency GSO FSS operations from unacceptable interference from NGSO FSS systems operating in the same frequencies.[34] Specifically, in accordance with Article 22 of the ITU Radio Regulations, if the applicable $EPFD_{up}$ limits are met, the NGSO FSS satellite system is considered to have met its obligations to protect GSO FSS networks from unacceptable interference. In this case, as demonstrated in the *Technical Attachment*, the O3b system will meet the applicable ITU $EPFD_{up}$ limits in all frequency ranges where these limits apply and which overlap those used by the O3b system (*i.e.*, 27.6-28.4 GHz).[35] As a result, co-coverage GSO FSS networks will not experience unacceptable interference in the 28.35-28.4 GHz band. In any event, O3b confirms that its operations will be on a secondary basis relative to U.S.-licensed GSO FSS networks in the same band.

The 17.8-18.3 GHz (Downlink) FS Band. This frequency band is allocated on a primary basis to FS, and there is no secondary allocation for NGSO FSS in the band. Accordingly, O3b requests a waiver of the Ka-Band Plan and Section 2.106 of the Commission's rules to permit O3b to operate its NGSO FSS system in the 17.8-18.3 GHz band for downlink operations on a non-conforming, non-interference basis.

---

33 *Northrop Grumman* at ¶¶ 72-73; *contactMEO* at ¶¶ 23-24.

34 *See* ITU Radio Regulations, Article 22. *See also Technical Attachment* at A.10.1 for a discussion of O3b's compliance with the operational limits in Article 22 of the ITU Radio Regulations.

35 *Technical Attachment* at A.10.1.

As noted above, in analyzing requests for non-conforming spectrum uses, the Commission has indicated it will generally grant such waivers where there is not potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from allocated services. In this case, O3b's proposed non-conforming use of the 17.8-18.3 GHz frequency band for downlink operations will not cause harmful interference to FS operations in the same band. This is because, as demonstrated in the *Technical Attachment*,[36] O3b will meet the PFD limits at the earth's surface prescribed by the ITU for the protection of terrestrial services in this band.[37] In addition, as a non-conforming user, O3b will accept interference from FS operations in the band. A coordination report from Comsearch and O3b's own analysis indicate only a limited number of existing FS licensees operating nearby in and around the 17.8-18.3 GHz band, none of which are likely to cause interference into O3b's operations.[38]

In the event that future FS licensees establish operations in the vicinity of Haleiwa, Hawaii that may impact O3b operations, O3b has identified at least three steps that can be undertaken to eliminate or mitigate potential interference. First, O3b can add bandpass filtering to its low noise amplifier assemblies. Second, O3b can modify the timing of satellite handover events such that they occur at higher elevation angles. Third,

---

[36] *See Technical Attachment* at A.10.3.

[37] *See* ITU Radio Regulations tbl. 21-4. *See also* Recommendation ITU-R SF.1483, at 4 ("Extensive studies have provided ample technical justification that the pfd limits of *recommends* 1 are certainly adequate to protect the FS systems from aggregate interference from the satellites of multiple, co-frequency non-GSO FSS systems operating in the 17.7-19.3 GHz band. Therefore, the pfd limits of *recommends* 1 are acceptable in that they protect the FS systems without unduly constraining the development of non-GSO FSS networks.").

[38] *See Technical Attachment* at A.10.3 and Appendix B, Sections 2-6.

O3b will work constructively with the FS licensee to explore alternate FS link configurations.[39]

In light of the foregoing, a waiver of Section 2.106 of the Commission's rules and the Ka-Band Plan is warranted because no harmful interference will result to incumbent FS operations, and the public interest is otherwise served by permitting O3b to bring its satellite services to new markets around the world.

The 27.6-28.35 GHz (Uplink) Band. This frequency band is allocated to the local multipoint distribution service ("LMDS") on a primary basis. NGSO FSS operations are allocated on a secondary basis in the same band and, therefore, no waiver of the Ka-Band Plan is required for O3b to operate in those frequencies.[40]

As noted above, however, a secondary NGSO user in the Ka-band shall not cause harmful interference to primary operations, nor can it claim protection from interference caused by primary operations. Moreover, in analyzing requests to operate on a secondary basis, the Commission requires applicants to demonstrate that their proposed secondary operations are not likely to cause harmful interference to primary operations.

As a secondary NGSO user in the 27.6-28.35 GHz frequency band, O3b makes no claim for protection from interference caused by LMDS operations. Moreover, as shown in the *Technical Attachment*, O3b's uplink operations from a single gateway earth station are not likely to interfere with primary LMDS operations in this band.[41] Specifically, O3b

---

[39] *See Technical Attachment* at Appendix B, Section 6 for more details concerning these mitigation techniques.

[40] *See Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services,* 12 FCC Rcd 22310, ¶ 42 (1997) ("GSO and NGSO FSS systems have equal status as secondary users in this band segment") (the "*Ka-band Third Report and Order*").

[41] *See Technical Attachment* at A.10.4.

obtained frequency coordination reports from Comsearch for LMDS licensees that may be impacted by O3b's proposed Ka-band operations. These reports indicate that there are only a handful of LMDS licensees that feasibly could be impacted by the O3b earth station in Haleiwa, Hawaii. None of these licensee has objected to O3b's proposed operations on a secondary basis following notification thereof by Comsearch. O3b's gateway earth station will be located away from the urban center where current and future LMDS operations are focused. This geographic separation, coupled with terrain path losses, should make secondary operations on a non-harmful interference basis by O3b feasible in the LMDS frequencies. Moreover, O3b has already identified four mitigation techniques that could be used if necessary to avoid interference in the future.[42] On this basis, O3b's use of the 27.6-28.35 GHz frequency band on a secondary basis is consistent with the Commission's rules and policies.

C. National Security, Law Enforcement, Foreign Policy, and Trade Issues

The Commission noted in its *DISCO II Order* that issues of national security, law enforcement, foreign policy, and trade are likely to arise only in very rare circumstances.[43] The Commission further noted that it would accord deference to the expertise of the Executive Branch in identifying and interpreting issues of this nature.[44] The O3b earth station application raises no such issues on its face. Thus, this element of the Commission's *DISCO II Order* market access analysis is also satisfied.

---

42 *See Technical Attachment* at Appendix B, Section 7.

43 *DISCO II Order* at ¶ 180.

44 *Id.*

D. Eligibility and Operational Requirements

Pursuant to Section 25.137 of the Commission's rules, earth station applicants seeking authority to operate with non-U.S. licensed space stations must provide the legal and technical information for the non-U.S. space station required by Part 25 of the Commission's rules, including Section 25.114.[45]

1. Legal and Technical Qualifications

The information set forth in this legal narrative, associated attachments, Schedule S, and the accompanying FCC Form 312 demonstrates compliance with the requirements of Section 25.137 and the other applicable Sections of Part 25 of the Commission's rules.

O3b highlights here certain Part 25 rules that warrant special attention:

(i) Section 25.145(e) – Prohibition Against Exclusive Arrangements

Section 25.145(e) of the Commission's rules precludes the Commission from granting a Ka-band FSS space station license to any applicant if it (or its affiliates) has or acquires an exclusive right to construct or operate space segment or earth stations, or to interchange traffic, for the purpose of handling traffic to or from the United States, its territories, or possessions.[46] O3b hereby confirms that it has no such exclusive right, and that it will not acquire such an exclusive right in the future.

(ii) Sections 25.137(d)(1) & 25.164(b) – Satellite Construction Milestones

Section 25.137(d)(1) of the Commission's rules requires earth station applicants requesting authority to operate with non-U.S. licensed space stations to demonstrate

---

[45] *See* 47 C.F.R. § 25.137(b). *See also DISCO II Order* at ¶ 189.

[46] 47 C.F.R. § 25.145(e).

compliance with satellite construction milestones.[47] The milestones for NGSO systems like O3b are set forth in Section 25.164(b) of the Commission's rules. They are as follows:

> (1) *One year*: Enter into a binding non-contingent contract to construct the licensed satellite system.
>
> (2) *Two years*: Complete the critical design review of the licensed satellite system.
>
> (3) *Two years, six months*: Begin the construction of the first satellite in the licensed satellite system.
>
> (4) *Three years, six months*: Launch and operate the first satellite in the licensed satellite system.
>
> (5) *Six years*: Bring all the satellites in the licensed satellite system into operation.
>
> These milestones are to be measured from the date the license is issued.[48]

On November 7, 2008, O3b signed a binding non-contingent satellite manufacturing contract with Thales Alenia Space to manufacture the satellite system with which this earth station is proposed to operate. Thus, the first construction milestone has already been satisfied. O3b also anticipates that it will satisfy each of the future milestones required under the Commission's rules. O3b will submit to the Commission the requisite information to demonstrate compliance with all future milestones as required by the Commission's rules.[49]

(iii) Sections 25.137(d)(4) & 25.165 – Posting of Bond

Section 25.137(d)(4) of the Commission's rules requires a bond to be posted where an earth station applicant seeks to communicate with non-U.S. licensed satellites that are

---

[47] 47 C.F.R. § 25.137(d)(1).

[48] 47 C.F.R. § 25.164(b).

[49] *See, e.g.,* 47 C.F.R. § 25.164(d) & (e).

not in orbit and operating.[50] For NGSO systems, the bond is typically in the amount of $5 million and must be posted within a short time following issuance of the U.S. authorization.[51] The party posting the bond, however, may reduce the amount of the bond by $1 million each time the space station licensee successfully meets a milestone.[52] As noted above, O3b has already satisfied the first construction milestone. O3b will submit a copy of the satellite manufacturing contract with Thales Alenia Space at a later date and will file a request for a reduction in the bond at that time.

2. Technical Waiver Requests

(i) Section 25.145(c) - Geographic Coverage

Section 25.145(c) of the Commission's rules requires Ka-band NGSO systems to provide service coverage (i) to all locations as far north as 70 degrees latitude and as far south as 55 degrees latitude for at least 75% of every 24-hour period and (ii) on a continuous basis throughout the fifty states, Puerto Rico and the U.S. Virgin Islands.[53] O3b cannot satisfy either of these requirements and respectfully requests a waiver of this rule for the reasons described below.

The O3b system is designed to make high-bandwidth "middle mile" Internet connectivity available to ISPs that wish to serve the "other three billion" people who currently have little or no Internet access at an affordable price. Because the majority of these people live outside of the United States and relatively close to the Equator, O3b chose an equatorial orbit for its constellation of satellites. Such an orbit, however,

---

[50] 47 C.F.R. § 25.137(d)(4).

[51] *Id. See also Amendment of the Commission's Space Station Licensing Rules and Policies*, 18 FCC Rcd 10760, ¶ 309 (2003).

[52] 47 C.F.R. § 25.137(d)(4). *See also* 47 C.F.R. § 25.165(d).

[53] 47 C.F.R. § 25.145(c).

necessarily implies a limitation on the northernmost and southernmost latitudes that can be served by the O3b system due to look-angle constraints. The O3b system is also designed to make efficient use of spectrum by deploying bandwidth only to where it is needed. Thus, rather than covering the entire visible earth, the steerable spot beams on the O3b satellites will be focused on customer locations and O3b gateways only, thus maximizing the throughput between these locations.

While O3b's orbital architecture means that the O3b satellite system cannot meet the requirements of Section 25.145(c), a waiver of those requirements is warranted in this case because noncompliance would not undermine the purpose of the rule and would, in fact, advance it. The Commission adopted the Ka-band NGSO geographic coverage requirements in order to foster a seamless global communications network.[54] In this case, the O3b system will do exactly that by bringing much-needed "middle-mile" Internet connectivity to parts of the world that lack such connectivity. The people who live in these regions (the "other three billion") represent more than 40% of the earth's population. Connecting them to the Internet is a profoundly simple and profoundly effective method of fostering a seamless global communications network.

Thus, given the unique mission and architecture of the O3b system, O3b respectfully requests that the Commission grant a waiver of the geographic coverage requirements to allow O3b to implement its proposed satellite service and gateway earth station in Hawaii.

(ii) Section 25.210(i)(1) – Cross-polarization Isolation

Section 25.210(i)(1) of the Commission's rules requires FSS space station antennas to provide a cross-polarization isolation such that the ratio of the on-axis co-

[54] *Ka-band Third Report and Order* at ¶ 34.

polar gain to the cross-polar gain of the antenna in the assigned frequency band is at least 30 dB within its primary coverage area.[55] As shown in the *Technical Attachment*, the minimum cross-polar isolation of the O3b satellite transmit and receive antennas is 18.5 dB, which is less than the minimum 30 dB requirement.[56] This shortfall is a direct result of the unique O3b system design, which utilizes steerable beam antennas in an effort to minimize handoff requirements. Note that the cross-polarization isolation value of 18.5 dB is a worst case value for either of the gateway beams that will be used to communicate with the earth station in Hawaii.[57]

The Commission's cross-polarization requirements are designed to avoid interference into other satellite networks. As noted in the *Technical Attachment*, it is the co-polar transmissions that will dictate the interference levels to and from other networks and systems and not the level of cross-polar radiation in the O3b system.[58] As explained in the *Technical Attachment*, O3b's worst case scenario cross-polar isolation will have no more than a negligible impact on other satellite networks, and O3b has determined that its own system can tolerate such cross-polarization isolation performance.[59] Moreover, the benefits of the O3b system design would be severely undermined if it were required to increase the cross-polarization levels to comply with this Commission rule. Thus, a waiver of Section 25.210(i)(1) is warranted in this case because strict adherence to the rule would thwart the public interest by preventing O3b from bringing its service to market, while granting the waiver will not undermine the purpose of the rule.

---

[55] 47 C.F.R. § 25.210(i)(1).

[56] *Technical Attachment* at A.14.

[57] *Id.*

[58] *Id.*

[59] *Id.*

(iii) Section 25.283(c) – Relief of Pressure Vessels

Section 25.283(c) of the Commission's rules requires a space station licensee to "ensure, unless prevented by technical failures beyond its control, that all stored energy sources on board the satellite are discharged, by venting excess propellant, discharging batteries, relieving pressure vessels, and other appropriate measures."[60] The purpose of this rule is to minimize the risk of accidental explosions after completion of mission operations.[61] As explained in the *Technical Attachment*, the O3b satellites will comply with this requirement except in one minor respect.[62]

O3b satellites will utilize a monopropellant blowdown propulsion system that has diaphragm propellant tanks with a membrane between the pressurant and the propellant. At the end-of-life of each O3b satellite, all of the propellant in the tank will be expelled but a small amount of pressurant will remain in the propellant tank (about 100 psia) that cannot be vented. To the extent one is required, O3b respectfully requests a waiver of Section 25.283(c) of the Commission's rules. While the residual pressurant in the propellant tank cannot be vented, it poses no risk of explosion for the spacecraft following post-mission disposal due to spacecraft design. The remaining pressure is only about 1/6th of the propellant tank burst pressure, 1/150th of the burst pressure of the tubing and welds, and 1/12th of the valve burst pressure. The propellant tanks are also shielded from external fracture from small debris. As a result, grant of a waiver of Section 25.283(c) of the Commission's rules in this case would not undermine the purpose of the rule.

---

[60] 47 C.F.R. § 25.283(c).

[61] *See* 47 C.F.R. § 25.114(d)(14)(ii) (requiring applicants to address whether stored energy will be removed at spacecraft end of life by, *inter alia*, "venting any pressurized system" as part of an assessment of the risk of accidental explosion).

[62] *See Technical Attachment* at A.13.2.

VI. CONCLUSION

As demonstrated herein and in all the materials with which this legal narrative is associated, O3b fully satisfies the Commission's requirements under the *DISCO II Order* for U.S. market access. Moreover, subject to a limited number of waiver requests, the O3b satellite system fully complies with the Commission's Part 25 rules. Thus, grant of this earth station application will serve the public interest, convenience and necessity. O3b respectfully requests that the Commission act swiftly to grant this application in order that O3b can bring affordable Internet access and other satellite-delivered services to the world's "other three billion" people as soon as possible.

Respectfully submitted,

O3B LIMITED

By: /s/William L. Lawrence
William L. Lawrence
General Counsel

July 23, 2010

Of Counsel:

Brian Weimer
Malika Levarlet
Sheppard Mullin Richter & Hampton, LLP
1300 I St., NW
11th Floor East
Washington, DC 20005
(202) 469-4904

ATTACHMENT A

O3B NON-GEOSTATONARY SATELLITE SYSTEM

ATTACHMENT A

Technical Information to Supplement Schedule S

A.1 Scope

This attachment contains the information required by §25.114 and other sections of the FCC's Part 25 rules that cannot be captured by the Schedule S software.

A.2 General Description of Overall System Facilities, Operations and Services (§25.114(d)(1))

The O3b non-GSO satellite system consists of a constellation of eight evenly spaced satellites in an equatorial circular medium earth orbit of altitude 8,062 km plus associated ground control facilities, gateway earth stations and end customer earth stations. The number of satellites in the constellation will increase over time to add necessary capacity and improve performance and operational flexibility, with a plan to deploy eight satellites with two initial launches to provide start of commercial service.[1]

The O3b system will provide wideband communications channels between customer earth stations and gateway earth stations located on the global fiber network. Initially, the customer earth stations will be medium sized terminals located in major cities in the parts of the world that lack any fiber connectivity to the global Internet infrastructure. This tends to be in geographic areas of low-to-medium latitudes which have good elevation angles to the O3b satellite orbit.

[1] Such expansion of the constellation will be covered in subsequent applications.

The fiber connected gateway earth stations will be at key locations around the world to ensure full-time connectivity to the O3b constellation. Two of these gateways are planned to be in US territory, and one of these is the focus of the accompanying earth station license application.[2] This gateway earth station will also act as one of the TT&C control stations for the O3b system. There will also be other TT&C earth stations around the world which provide additional monitoring and control capability for the O3b satellite constellation.

The satellite control center for the O3b satellite constellation will be in Betzdorf, Luxembourg, with a backup facility located in the United States (location not yet determined). Network operations will be controlled from a facility in Manassas, VA. Connectivity between these control centers and the TT&C earth stations will be implemented using terrestrial leased circuits or secure Internet virtual private networks (VPN).

The O3b satellite constellation will operate under a UK registration at the ITU (network name "O3B-A"). Further details of this are provided in Section A.12 below.

Each O3b satellite contains 20 wideband (216 MHz) channels and 12 identical and independently steerable antennas. In the normal mode of operation, ten of these channels are used for links from two gateway beams to ten user beams ("forward links") and ten different channels for links from the same ten user beams back to the same two gateways ("return links"). However, each O3b satellite may be reconfigured differently from this normal mode, as explained in Appendix A.

Each forward channel downlinking in a user beam will operate with one channel per active traveling-wave tube amplifier ("TWTA"). Each group of return channels that downlinks to the same gateway beam will be combined and transmitted in a single active TWTA per gateway

---

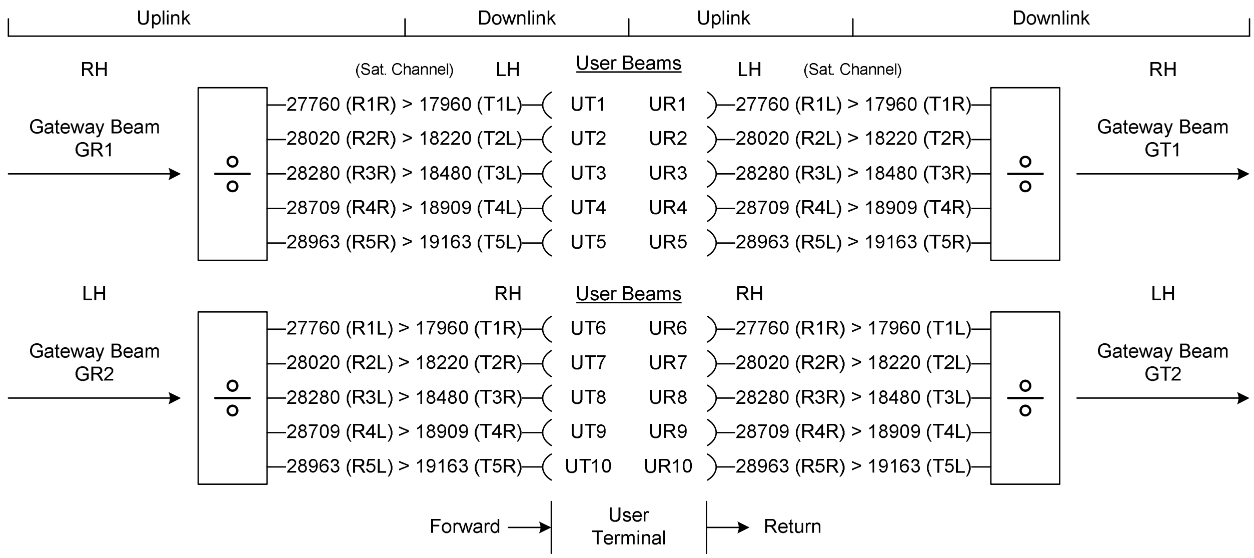
[2] The second US gateway earth station will be the subject of a separate FCC application.

downlink beam. In total there will be 12 active TWTAs per O3b satellite, with one dedicated to each downlink beam. All TWTAs will be 65 Watt output power level.

In the normal mode of operation each wideband channel, for uplinks from and downlinks to user beams, is connected to one of the ten independently steerable user spot beam antennas on the satellite. These ten steerable spot beams are pointed towards the target geographic locations where the customer earth stations are located. Each of the two groups of five channels is connected to the remaining two independently steerable gateway spot beam antennas which can be pointed towards two geographically separate gateway earth stations or towards the same gateway location. All steerable spot beams are pointed to constant positions on the Earth as the O3b satellite traverses its active arc above those Earth positions. At the beginning and end of the active arc that serves each ground position the steerable spot beams are repointed to provide the necessary connectivity for the next active arc. Handover of traffic between satellites is handled seamlessly as there are always two satellites visible to each earth station at the times that satellite handover is required.

The O3b system will use the 27.6-28.4 GHz and 28.6-29.1 GHz uplink bands and the 17.8-18.6 GHz and 18.8-19.3 GHz downlink bands. TT&C operations will be performed at all phases of the mission in the band edges just below 29.1 GHz (uplink) and 19.3 GHz (downlink). Four-fold frequency re-use (per satellite) is achieved by a combination of dual orthogonal polarization and spatial beam isolation (between gateway and customer beams). A schematic of the use of the frequency spectrum between gateway and user beams, for the normal configuration, is given in Figure A.2-1 below. The terminology used in Figure A.2-1 is consistent with that used in the associated Schedule S. The forward uplinks from each of the two gateway beams (GR1 and GR2) are separated in the satellite into five channels (numbered R1R/T1L to R5R/T5L for GR1 and R1L/T1R to R5L/T5R for GR2) and retransmitted on the downlink toward five separate downlink user beams (User Beams UT1 to UT5 for GR1 and User Beams UT6 to UT10 for GR2). Similarly, the return uplinks from the ten user beams (UR1 to UR10) in the ten channels are multiplexed in the satellite into two groups of five channels and downlinked to the originating gateway beams (channels R1L/T1R to R5L/T5R towards GT1 and channels R1R/T1L to R5R/T5L towards GT2).

Figure A.2-1: Schematic showing the use of spectrum between beams (normal configuration)



A.3 Predicted Space Station Antenna Gain Contours (§25.114(d)(3))

The mid-band antenna gain contours for the O3b satellite receive and transmit beams, as required by §25.114(d)(3), are given in PDF format and embedded in the associated Schedule S submission. Although all transmit beams are identical, and all receive beams are identical, the beams are shown by two sets of examples in the Schedule S, as follows:

(a) For all the gateway receive beams and the gateway transmit beams the antenna is directed towards Hawaii;

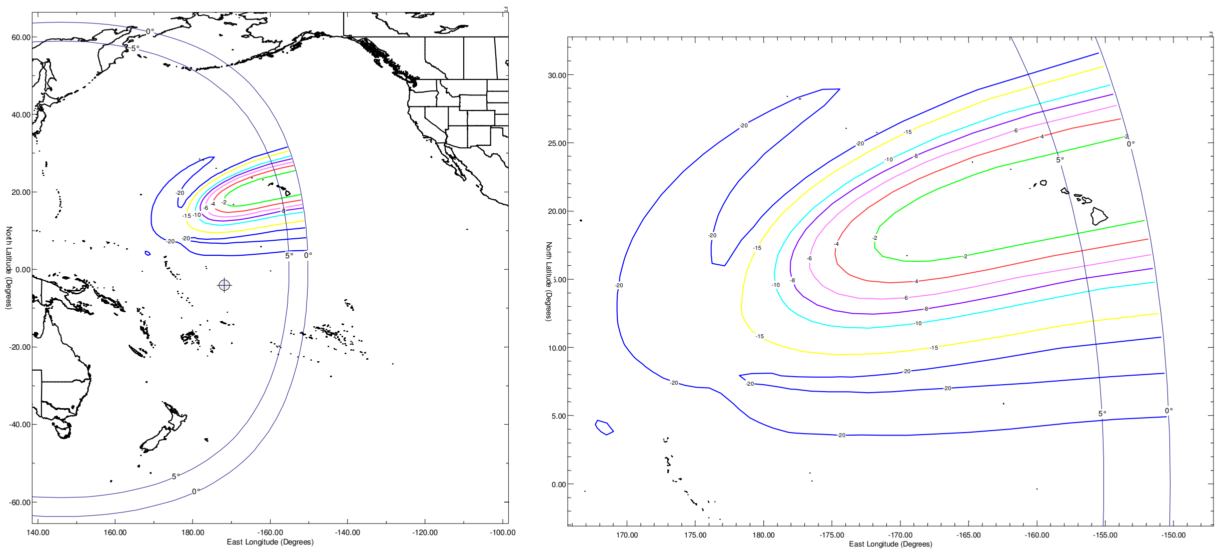
(b) For all the user receive beams and the user transmit beams the antenna is directed towards Suva, Fiji.

For all of these beam contour diagrams embedded in the Schedule S the position of the O3b satellite has been arbitrarily set at 158°W, the same longitude as Hawaii.

Figures A.3-1 through A.3-4 below further demonstrate the effects on the satellite antenna gain contours of the movement of the O3b satellite in its orbit as the beams are pointed to different parts of the visible Earth. Various satellite positions are shown starting with the O3b satellite appearing at 5° elevation angle in the west as viewed from the Hawaii earth station (see Figure A.3-1). At this satellite position the US west coast is not visible to the O3b satellite as it is below the horizon. The next O3b satellite position (Figure A.3-2) is at the point where the US west coast first becomes visible to the O3b satellite. The third O3b satellite position (Figure A.3-3) is when it is at the same longitude as the Hawaii earth station. The fourth is when the O3b satellite is disappearing below the 5° elevation angle in the east as viewed from the Hawaii earth station (Figure A.3-4). For each of these Figures both the transmit and receive antenna gain contours are shown.

Figure A.3-1: Satellite antenna gain contours when O3b satellite is at 146°E

(a) Transmit



(b) Receive

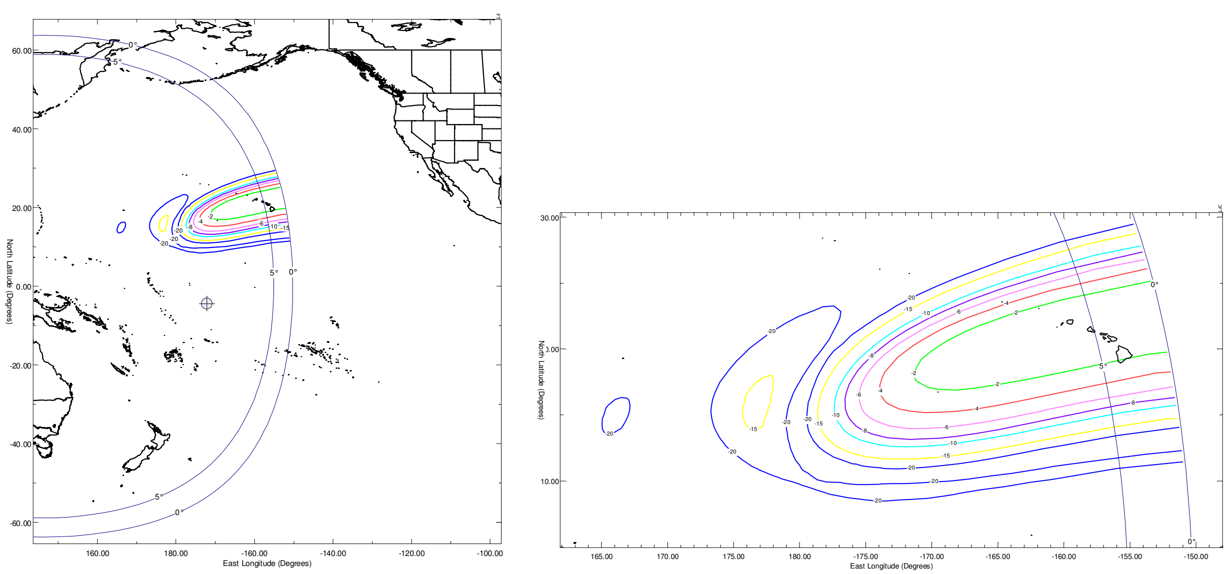
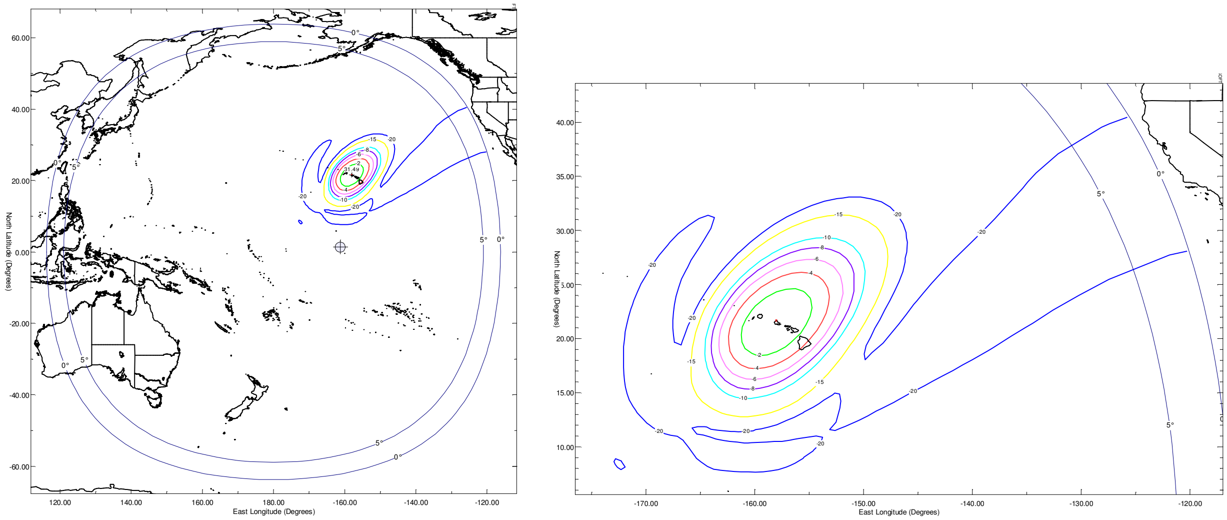


Figure A.3-2: Satellite antenna gain contours when O3b satellite is at 180°W

(a) Transmit



(b) Receive

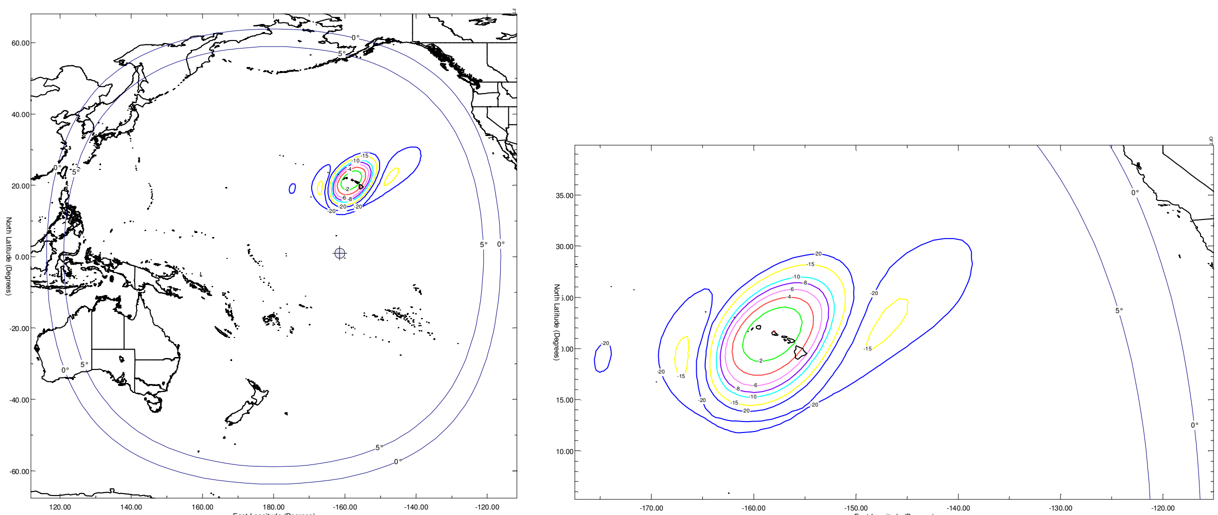
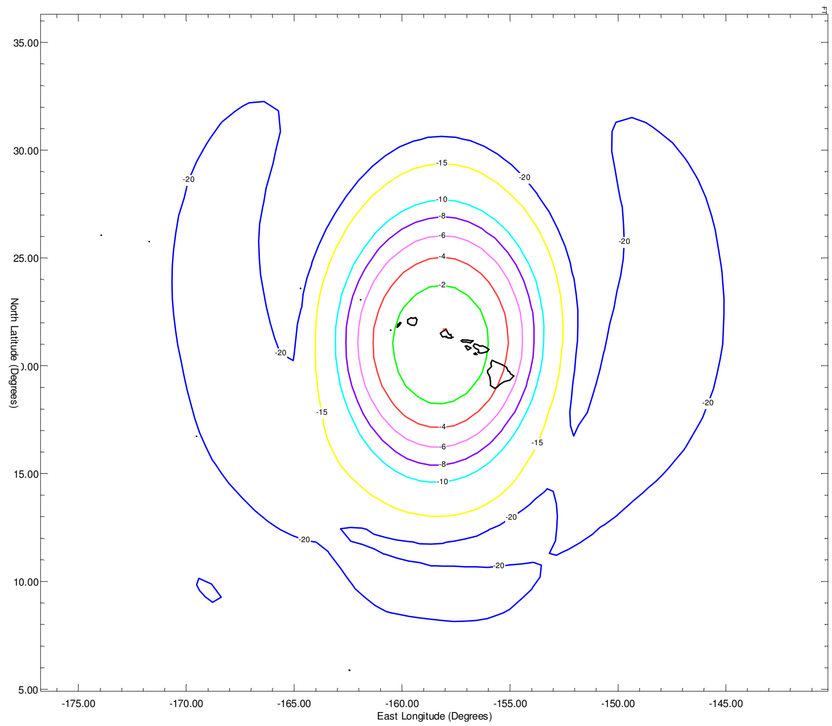


Figure A.3-3: Satellite antenna gain contours when O3b satellite is at 158°W

(a) Transmit



(b) Receive

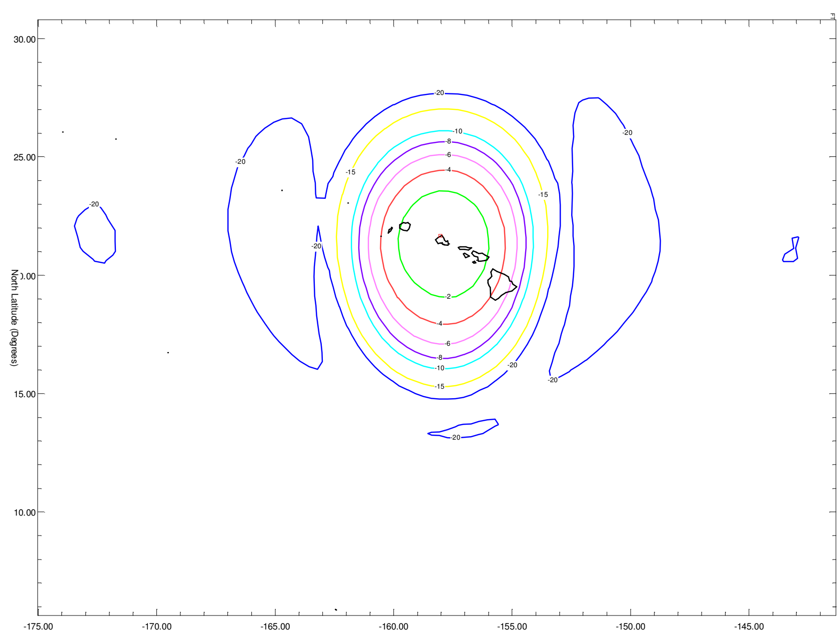
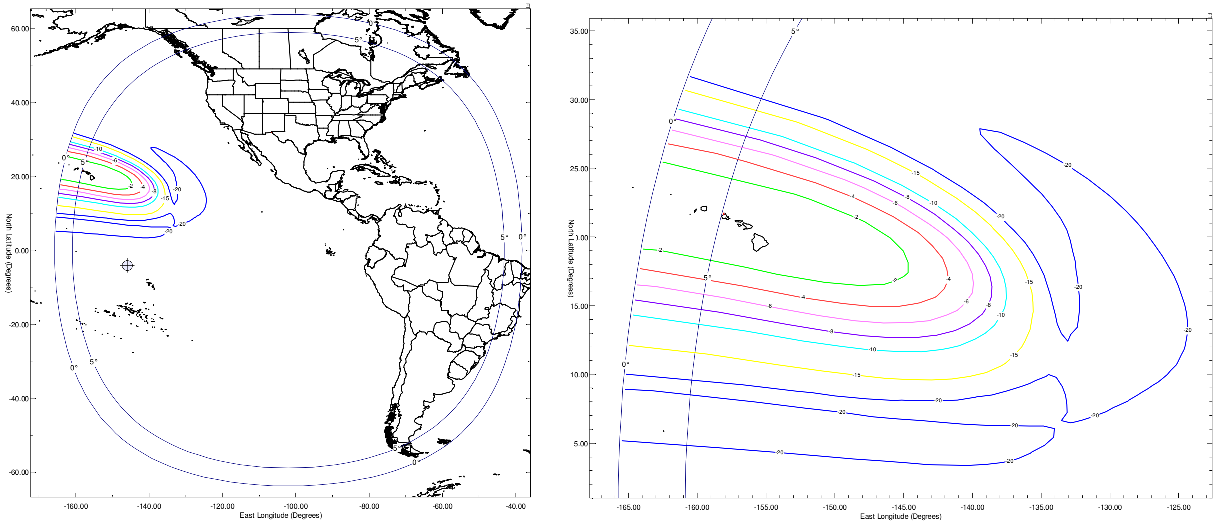
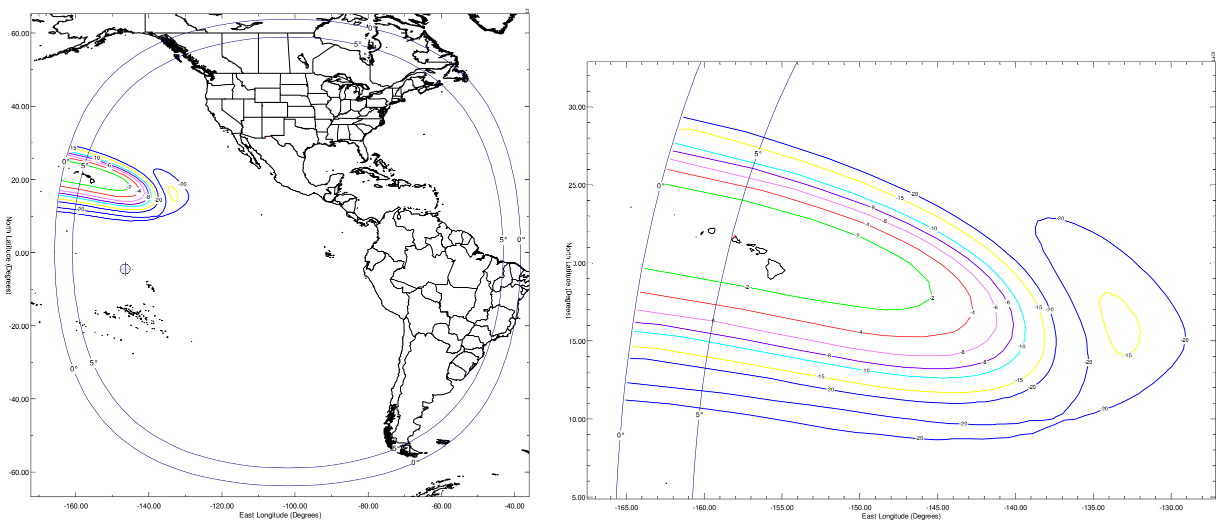


Figure A.3-4: Satellite antenna gain contours when O3b satellite is at 102°W

(a) Transmit



(b) Receive



A.4 Geographic Coverage
(§25.145(c))

The O3b system is not designed with the provision of ubiquitous satellite service in mind. Rather, it is designed primarily to provide high-performance cost-effective communications to the "other three billion" people who currently have little or no Internet access at an affordable price. The majority of these people live outside of the United States at the low-to-medium latitudes relatively near the equator. This directly determines the orbit used for the O3b constellation, which is equatorial and relatively low in altitude compared to the geostationary orbit. In turn, this means that satellites in the O3b orbit cannot see locations at as high latitudes as can geostationary satellites, as demonstrated by Figure A.4-1 below which compares the elevation contours for the O3b orbit to those for the geostationary orbit for the same satellite longitude, which is arbitrarily assumed to be 115°W.

Figure A.4-1(a): Elevation angle contours for geostationary satellite orbit

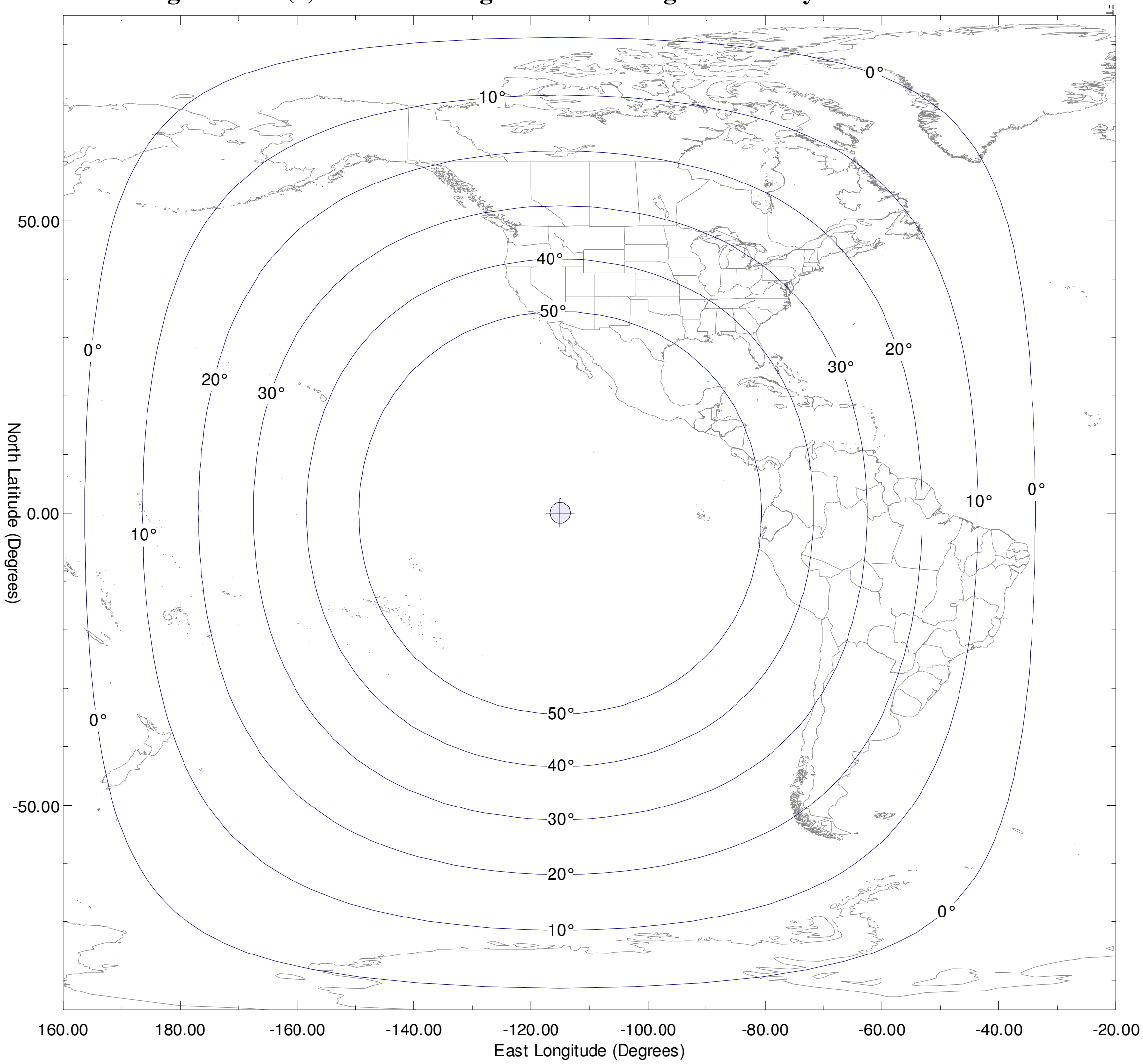
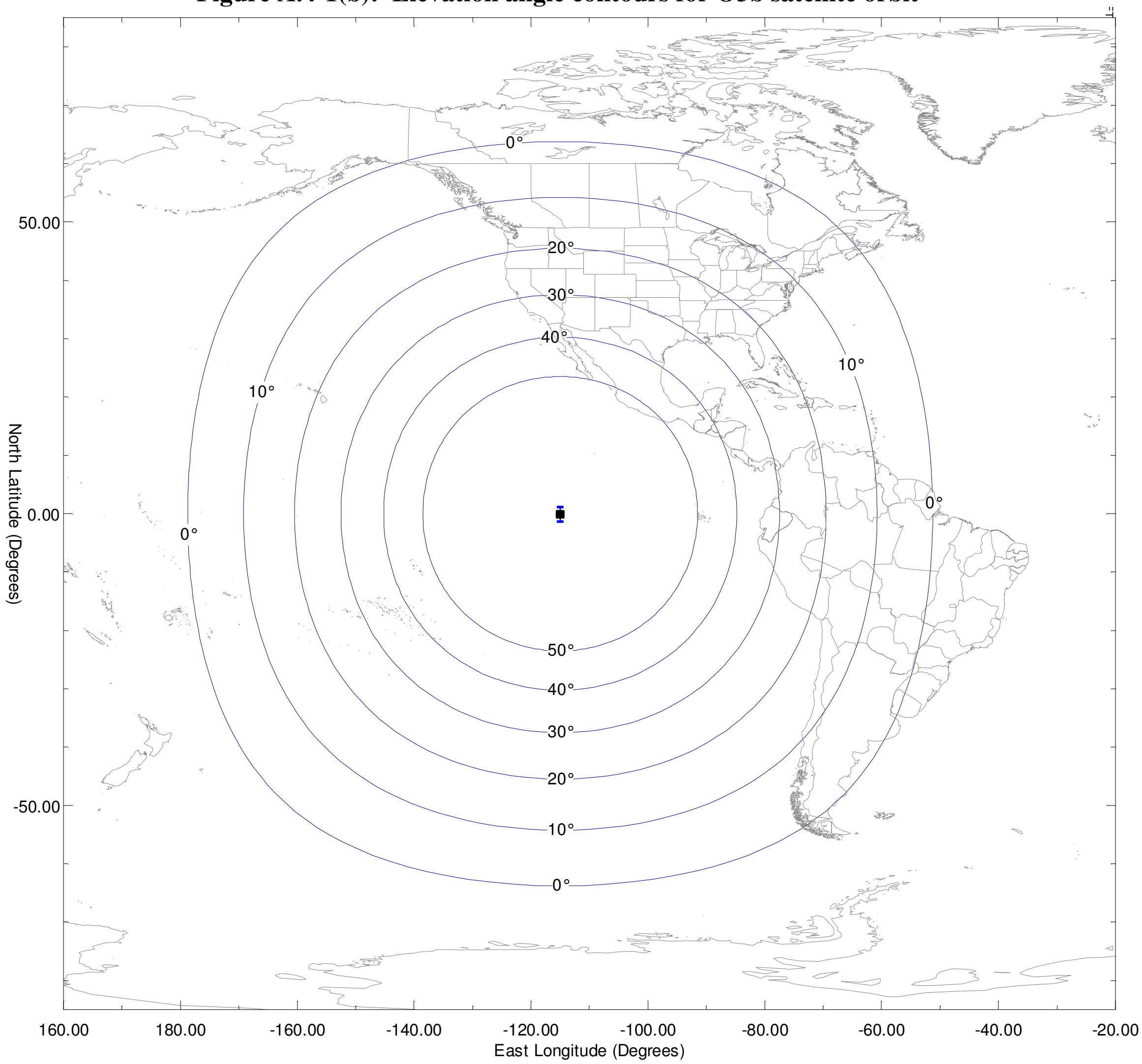


Figure A.4-1(b): Elevation angle contours for O3b satellite orbit



In addition, the O3b system is designed to make efficient use of spectrum and satellite power by deploying bandwidth only to where it is needed – *i.e.* to where customers are located. Rather than covering the entire visible earth, the steerable spot beams on the O3b satellites will be focused on customer locations and O3b gateways only, thus maximizing the throughput between those locations and ensuring a high-performance link into the global Internet or into the public switched telephone network. This system design means that the O3b system cannot meet §25.145(c) of the Commission's rules for geographic coverage by non-GSO FSS systems in the Ka-band. That rule requires coverage between 55°S and 70°N for at least 75% of every 24-hours and continuous coverage of the 50 states, Puerto Rico and the U.S. Virgin Islands. From the above elevation diagrams it can be seen that at approximately 64° latitude the elevation from the O3b satellite orbit is zero, so service to 70°N is impossible from the O3b orbit. At 55° latitude the elevation is less than 10°, even for the sub-satellite longitude, and so service performance, although possible, would be reduced significantly in terms of achievable data rates and link availability due to blockage and particularly rain attenuation problems cause by the low elevation angle and high operating frequency. From the O3b orbit service to the northern parts of CONUS would be just feasible, albeit with undesirably low elevation angles, and service to anything more than the very southern part of Alaska would not be possible as it is not visible to the O3b orbit. Service to Hawaii, Puerto Rico and the US Virgin Islands is possible for 100% of the time at high elevation angles.

Because the O3b network will nevertheless promote a seamless global communications network, O3b respectfully requests a waiver of the Commission's geographic service requirements for the reasons set out in the legal narrative of this Application.

A.5 Services to be Provided (§25.114(d)(4))

The communications services to be provided by the O3b system are also described briefly in Section A.2 above.

Each 216 MHz wide channel will typically support a single wideband carrier supporting a variable information data rate, depending on the instantaneous modulation and coding scheme employed. Adaptive coding and modulation ("ACM") will be used to ensure the optimum data throughput as a function of the link margin available at the time, which varies as a function of rain fade as well as the time varying geometry of the link due to the moving O3b satellite. Other transmission plans may also be operated in the O3b transponders, involving more than one carrier per 216 MHz channel, and this mode of operation will also involve the use of ACM.

The transmission capability of each wideband channel is dedicated to a particular spot beam, but may be shared by multiple earth stations within the service area of the spot beam.

The types of services currently foreseen for the O3b system are:

- Tier 1 service to earth stations of typically 4.5 meters antenna diameter,[3] providing Internet trunking services at fiber like data speeds and latency between a gateway terminal connected to the global fiber infrastructure such as Hawaii and 4.5 meter customer terminals close to the center of a user spot beam;

- Tier 2 service to earth stations of typically 1.2 to 2 meters antenna diameter,[3] providing cellular backhaul services and VSAT network services. Multiple customer terminals can be accommodated within the spot beam diameter of ~600km to enable O3b customers to provide point to multi-point connectivity services between cell towers and base stations and the global Internet and the public switched telephone network.

Representative link budgets, which include details of the transmission characteristics, performance objectives and earth station characteristics, are provided in the associated Schedule S submission, and further described in Section A.5.2 below.

A.5.1 Earth Stations

There are three broad categories of earth stations in the O3b system – the TT&C stations, the gateways, and the customer terminals.

---

[3] This application does not seek authority to operate any customer earth stations. They are described here in order to depict the types of services planned in the O3b system.

The accompanying application for an earth station license relates to a single earth station to be located in US territory (Sunset Beach, Hawaii) which will be used both as a gateway in the O3b system and as one of the TT&C stations for the O3b satellite constellation. This earth station will be a key facility for O3b as it provides access to the O3b satellites as they traverse the Pacific ocean region. The earth station antennas will be 7.3 meters in diameter and will consist of two active tracking antennas plus a backup antenna, and associated electronics so that continuity of service can be provided in accessing the O3b satellites.

The customer earth stations (which are not the subject of this application) will be typically in the range 1.2 to 4.5 meters in antenna diameter. Each station will consist of two tracking antennas and associated electronics so that continuity of service can be provided in accessing the O3b satellites.

A.5.2 Link Budgets and Modulation/Coding Schemes

The transmissions in the O3b system will use various modulation and FEC coding schemes, as listed in Table A.5.2-1 below.

Table A.5.2-1: Range of modulation and coding schemes for communications traffic

Modulation	Symbols	FEC (“Forward Error Correction”) Rate
32APSK	5	0.833
32APSK	5	0.8
32APSK	5	0.75
16APSK	4	0.9
16APSK	4	0.889
16APSK	4	0.833
16APSK	4	0.8
16APSK	4	0.75
16APSK	4	0.667
8PSK	3	0.9
8PSK	3	0.889
8PSK	3	0.833
8PSK	3	0.75
8PSK	3	0.667
8PSK	3	0.6
QPSK	2	0.9
QPSK	2	0.889
QPSK	2	0.833
QPSK	2	0.8
QPSK	2	0.75
QPSK	2	0.667
QPSK	2	0.6
QPSK	2	0.5
QPSK	2	0.4
QPSK	2	0.333
QPSK	2	0.25

The ACM scheme will ensure that the modems will automatically and adaptively select the optimum coding level and modulation type from the above list depending on the link margin prevailing at the time.

The associated Schedule S submission includes a representative and bounding set of these modulation and coding combinations, in conjunction with the various emission bandwidths, in order to limit the amount of unnecessary data provided. The representative set consists of the following:

a) 32APSK with 0.833 rate FEC

b) 16APSK with 0.75 rate FEC

c) 8PSK with 0.667 rate FEC

d) QPSK with 0.667 rate FEC

e) QPSK with 0.25 rate FEC

Each of these schemes has its associated bandwidth and power efficiencies as given in tab S11 of the associated Schedule S.

Representative link budgets for the above schemes are provided as attachments embedded in the associated Schedule S. The link budgets assume the use of ACM and show the instantaneous link performance for the various modulation and coding schemes listed above in order to demonstrate the level of performance achievable.

A.6 TT&C Characteristics (§25.114(c)(4)(i), §25.114(c)(9) and §25.202(g))

The information provided in this section complements that provided in the associated Schedule S submission.

The O3b TT&C sub-system provides for communications during pre-launch, transfer orbit and on-station operations, as well as during spacecraft emergencies. The TT&C sub-system will operate at the edges of the communications uplink and downlink frequency ranges and within the portion of Ka-band allocated to non-GSO satellite systems during all phases of the mission. This ensures consistency with §25.202(g).

During all phases of the mission, including transfer orbit, spacecraft emergencies and normal operations, the TT&C uplink signals will be received by the satellite using a combination of antennas on the satellite that create a near omni-directional gain pattern. The TT&C downlink signals will also be transmitted by the satellite using a combination of antennas on the satellite that create a near omni-directional gain pattern. However, for normal operations, where the spacecraft is directed towards the Earth, the minimum operational antenna gain of the TT&C downlink antenna will be higher than for safe-mode operations (i.e., during transfer orbit and spacecraft emergencies).

A summary of the TT&C subsystem characteristics is given in Table A6-1.

Table A6-1: TT&C Performance Characteristics

Command Modulation	PCM/PSK
Command Frequencies	29,088.5 MHz
Uplink Flux Density (Minimum)	>-80 dBW/m^2 (Command)
Polarization of Satellite Rx/Tx Antennas	Rx: LHC Tx: LHC and RHC
Telemetry Frequencies Notes: 1. Each satellite is equipped with two of these frequencies. 2. Frequencies can be re-used when more than 8 O3b satellites are in operation.	19296.6 MHz 19296.8 MHz 19297.0 MHz 19297.2 MHz 19297.4 MHz 19297.6 MHz 19297.8 MHz 19298.0 MHz 19298.2 MHz 19298.4 MHz 19298.6 MHz 19298.8 MHz 19299.0 MHz 19299.2 MHz 19299.4 MHz 19299.6 MHz
Maximum Downlink EIRP	+20.5 dBW (Transfer orbit and emergency modes) +5.2 dBW (Normal mode)

A.7 Satellite Transponder Frequency Responses (§25.114(c)(4)(vii))

The predicted channel filter response performance is given in Table A7-1 below. The frequency response is measured from the satellite receive antenna up to the input of the TWTA. There is no narrow-band post-TWTA channel filtering because no channels need to be multiplexed into any antenna ports. To ensure there is negligible spectral re-growth the TWTA is always operated in a linear backed-off mode.

Table A.7-1 - Typical Channel Filter Responses

Frequency offset from channel center	Gain relative to channel center frequency (dB)	Comments
CF ± 50 MHz	-0.35	In-Band Value does not exceed these p-p values
CF ± 67 MHz	-0.4	
CF ± 83 MHz	-0.8	
CF ± 99 MHz	-1.8	
CF ± 108.5 MHz	-3	
CF ± 152 MHz	-28	Out-of-Band Attenuation is not less than these values
CF ± 540 MHz	-78	

A.8 Cessation of Emissions (§25.207)

Each active satellite transmission chain (channel amplifiers and associated TWTA) can be individually turned on and off by ground telecommand, thereby causing definite cessation of emissions from the satellite, as required by §25.207 of the Commission's rules.

A.9 Compliance with PFD Limits
((§25.208(c))

The O3b system complies with all applicable FCC and ITU Power Flux Density ("PFD") limits. §25.208(c) contains PFD limits that apply in the various portions of the Ka-bands. The only Ka-band frequency range listed in §25.208(c) which overlaps with frequency ranges used by O3b is the 18.3-18.8 GHz band. The PFD limits of §25.208(c) in this band is as follows:

- -115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- -115+(δ-5)/2 dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and
- -105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

In addition, §25.208(d) contains PFD limits that apply in the 18.6-18.8 GHz band, but this band is not used by the O3b system.

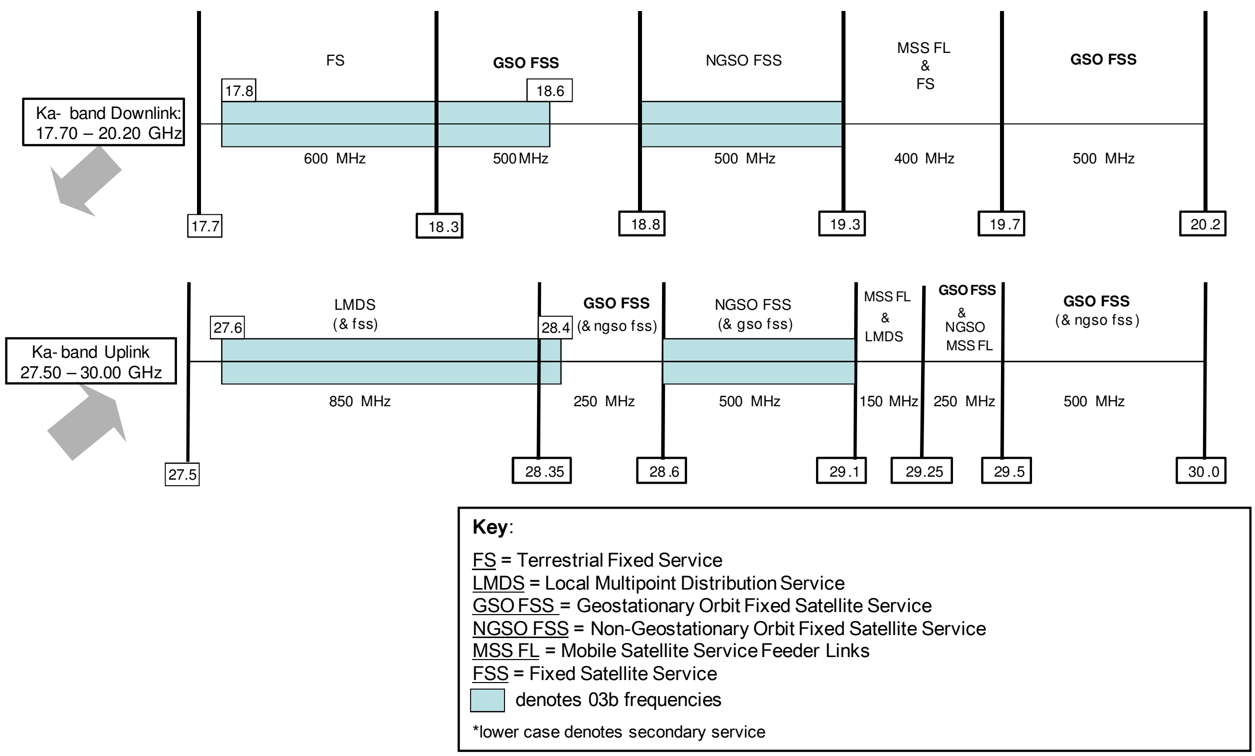
§25.208(c) does not contain any PFD limits that apply in the 17.8-18.3 GHz or 18.8-19.3 GHz bands, which are also used by O3b. However it is noted that Article 21 (Table 21-4) of the ITU Radio Regulations does include PFD limits applicable to non-GSO satellite systems using the O3b type of orbit, applicable across these frequency ranges, which are identical to the values in the PFD limits of §25.208(c) of the FCC rules listed above. Therefore it is reasonable to assume that these same PFD levels protect terrestrial services across these other bands as well, as that is the inherent assumption in the ITU Radio Regulations.

Compliance with the PFD limits referenced above is demonstrated below using a simple worst-case methodology. The maximum (saturated TWTA) downlink EIRP per channel (stated in the accompanying Schedule S) for the O3b satellites is 49.7 dBW. Normally this EIRP is spread across the channel bandwidth of 216 MHz which results in an EIRP density of 26.4 dBW/MHz. In some situations the spread bandwidth of this signal may be reduced to 40 MHz, which would increase the maximum EIRP density to 33.7 dBW/MHz. Using this worst case value, and taking the shortest distance from the O3b satellite to the Earth's surface (8,062 km), the worst case (i.e., smallest) spreading loss is 149.1 dB. Therefore the highest PFD at the Earth's surface, for the nadir situation and for the worst case EIRP density of 33.7 dBW/MHz, is -115.4 dBW/m^2/MHz, which is less than the -115 dBW/m^2/MHz PFD limit value that applies at elevation angles of 5° and below.

A.10 Interference Analyses (§25.214(d)(13), §25.261)

Figure A.10-1 below shows the frequency plan for O3b together with the FCC's Ka-band frequency allocations. This is being provided to accompany the more detailed explanations of each sharing / interference scenario described in the sub-sections below.

Figure A.10-1: Frequency plan for O3b showing the FCC Ka-band frequency allocations



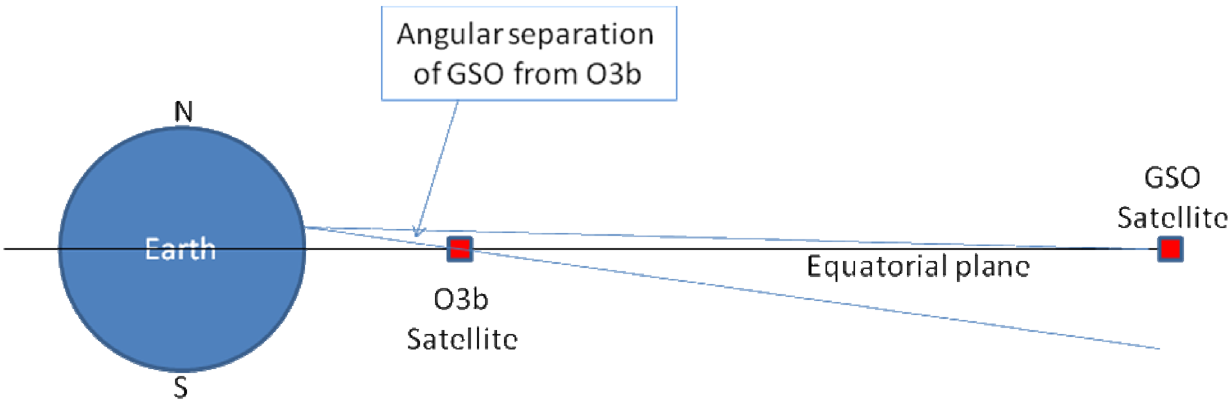
A.10.1 Interference with Respect to GSO Satellite Networks

The O3b non-GSO satellite system has been designed to provide the necessary interference protection to GSO satellite networks as required under Article 22 of the ITU Radio Regulations. Specifically, No. 22.5C defines Equivalent Power Flux Density ("EPFD") limits for the downlink transmissions from a non-GSO satellite system in certain frequency ranges that must be met in order to not cause unacceptable interference to GSO satellite networks. Similarly, No. 22.5D defines corresponding EPFD limits applicable to the uplinks from a non-GSO satellite system. No. 22.5I defines operational EPFD limits also applicable to the downlinks from a non-GSO satellite system. O3b will meet these EPFD limits that apply within the frequency ranges used by O3b, and all other obligations of the ITU Radio Regulations in this regard, including the operational limits to the downlink EPFD, within the frequency ranges where such limits apply. The frequency ranges where EPFD limits apply are:

- Uplink: 27.6-28.4 GHz
- Downlink: 17.8-18.6 GHz

O3b will meet the EPFD limits by constraining the uplink earth station EIRP density and the downlink PFD at the Earth's surface from the O3b system within these frequency ranges depending on the Earth latitude at which the relevant beam is operating. This technique effectively limits the interference to GSO satellite networks by exploiting the inherent angular separation of the O3b and the GSO orbits when viewed from the surface of the Earth at latitudes away from the equator. This angular separation also protects the O3b system from interference from GSO satellite networks at latitudes away from the equator. The angular separation geometry is shown in Figure A.10-2 below where the off-axis angle, θ, becomes larger as the latitude of the Earth location increases (either North or South of the equator).

Figure A.10-2: Inherent angular separation geometry of the O3b orbit relative to the GSO orbit for earth locations away from the equator



As an example, for a latitude of 20° (north or south) the minimum separation angle θ varies from 7° to 11° depending on the difference in longitude between the Earth location and the O3b satellite, with the lower value applying to the case where the O3b satellite is at a very low elevation angle (~5°) as viewed from the Earth. Thus O3b is able to operate using higher uplink and downlink power density levels further away in latitude from the equator, which means it can use smaller earth stations at higher latitudes and must use larger earth stations at lower latitudes, within these frequency ranges where EPFD limits apply. While there is no hard cut-off in terms of latitude for O3b services within these frequency ranges in order to comply with the ITU EPFD limits, for latitudes greater than 20° there are no practical constraints on O3b operations, and between 10° and 20° latitude the practical constraints are minimal. Between 5° and 10° latitude the constraints will limit the minimum size of earth station that can be used and for latitudes less than 5° the constraints will be very significant and will limit certain O3b service in these bands where EPFD limits apply.

Figure A.10-3 below shows one example of the computed EPFD(down) levels for the O3b system compared to the EPFD(down) mask from No. 22.5C of the ITU Radio Regulations, which is the one related to the 1 meter reference GSO earth station antenna. As expected, that EPFD mask is found to be the most constraining on O3b operations as it involves the smallest GSO receiving earth station which has the minimum off-axis discrimination. The computed EPFD in this example is for a latitude of 14° although the shape of the EPFD characteristic for O3b is consistent over a wide range of latitudes from typically 3° latitude and higher. The O3b EPFD(down) levels have been derived from a time-domain simulation of the O3b system using Visualyze software, consistent with ITU definitions and EPFD software requirements.[4]

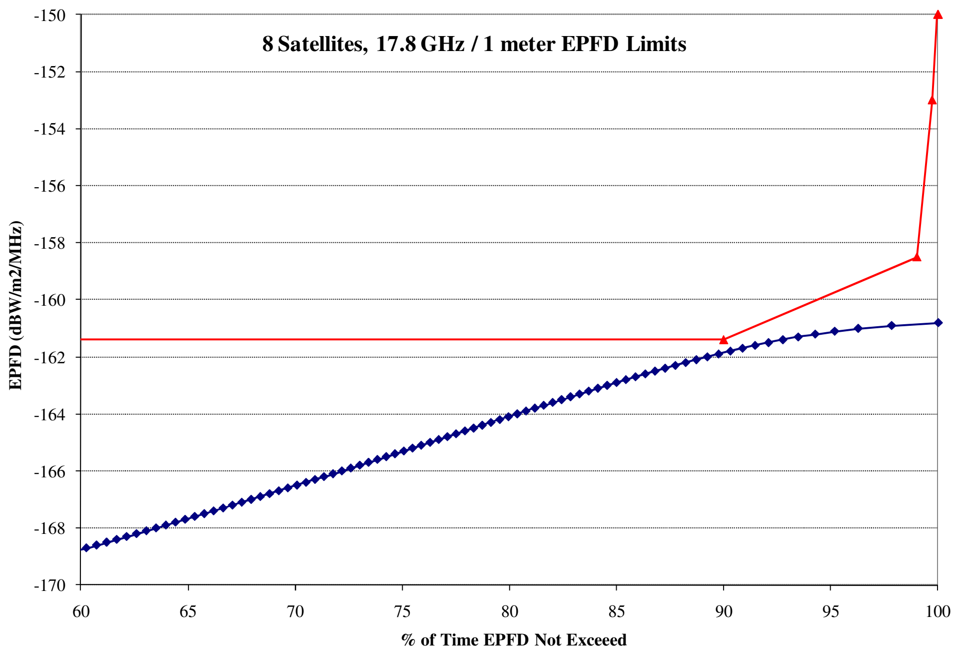
From Figure A.10-3 it can be seen that compliance is achieved for all the defined percentages of time, although the most constraining EPFD limit value is the one that applies for 90% of the time. This means that there is considerable margin against the EPFD limit value that applies for 100% of the time, which helps to ensure that O3b will not violate the *operational* EPFD limit values in Article 22 of the Radio Regulations.[5] The variation in EPFD(down) as a function of the difference in longitude between the GSO earth station and the O3b satellite has also been determined using Visualyze, and this, together with the latitude dependence, will be factored into the operational EIRP density levels of the O3b downlink beams as a function of their pointing direction towards the Earth's surface.

---

4 See ITU-R Recommendation S.1503 entitled "Functional description to be used in developing software tools for determining conformity of non-GSO satellite orbit fixed-satellite system networks with limits contained in Article 22 of the Radio Regulations".

5 The operational EPFD limits for Ka band (see No. 22.5I and Table 22-4B) provide a single limit to be met for 100% of the time.

Figure A.10-3: Comparison of EPFD(down) levels from O3b with ITU mask values (17.8-18.6 GHz) (Red = ITU Mask; Blue = O3b Levels)(14° latitude)



A straightforward demonstration of the EPFD(down) compliance for the case of the Hawaii beam is given below, using a simplistic worst-case methodology. The minimum angular separation between the O3b orbit and the GSO orbit, as seen from Hawaii, is 7.1°, and this occurs for the extreme case of zero elevation angle to the O3b satellite. The smallest reference receiving earth station in the EPFD(down) limits of the Radio Regulations, applicable to the 17.8-18.6 GHz band, is 1 meter, and this is also the worst case for determining EPFD compliance. The 1 meter reference earth station has a peak antenna gain of 43.1 dBi, an off-axis gain of 7.7 dBi and therefore an off-axis discrimination of 35.4 dB for the minimum off-axis angle of 7.1°. The gateway downlinks in the O3b system (such as Hawaii) will operate with a 4 dB output back-off below TWTA saturation, and the available power will be spread across up to five wideband carriers. In the worst case the highest downlink PFD for the Hawaii gateway downlink will not exceed -127 dBW/m^2/MHz, within the O3b frequency ranges where EPFD limits apply.[6] Taking this maximum PFD value towards Hawaii, the resulting worst-case EPFD(down) level would be -162.4 dBW/m^2/MHz (i.e., -127-35.4), which compares to the lowest (i.e., 100% of the time) EPFD(down) limit value of -161.4 dBW/m^2/MHz for the 1 meter reference earth station. Therefore compliance exists with margin, even against the lowest EPFD(down) level, which applies for up to 90% of the time, in the EPFD(down) mask.

The EPFD(up) limits in No. 22.5D of the Radio Regulations take the form of a single EPFD(up) value that must never be exceeded (-162 dBW/m^2/40 kHz in the 27.5-28.6 GHz band). O3b will comply with this limit, in the O3b frequency ranges where such EPFD limits apply, by controlling the maximum power spectral density into transmitting earth stations as a function of their latitude and their antenna size and off-axis gain towards the GSO.

Using a similar methodology to that described above for the EPFD(down) case, the following demonstrates how the O3b uplink transmissions from Hawaii comply with the EPFD(up) limits in the O3b frequency ranges where such EPFD limits apply. The maximum earth station EIRP density transmitted by the Hawaii earth station, in frequency bands where EPFD(up) limits apply, is 40.0 dBW/4kHz, which is equivalent to 50.0 dBW/40kHz (i.e., the reference bandwidth used for the EPFD(up) limit). The peak earth station antenna gain is 64.9 dBi, giving a maximum input power spectral density of -14.9 dBW/40kHz. The off-axis gain of the transmitting earth station is 10.7 dBi for the off-axis angle of 7.1° as used above for the EPFD(down) analysis case, assuming 32-25log(θ) gain mask for this range of off-axis angles for the transmitting earth station. That results in a worst-case off-axis EIRP density towards the GSO of -4.2 dBW/40kHz

---

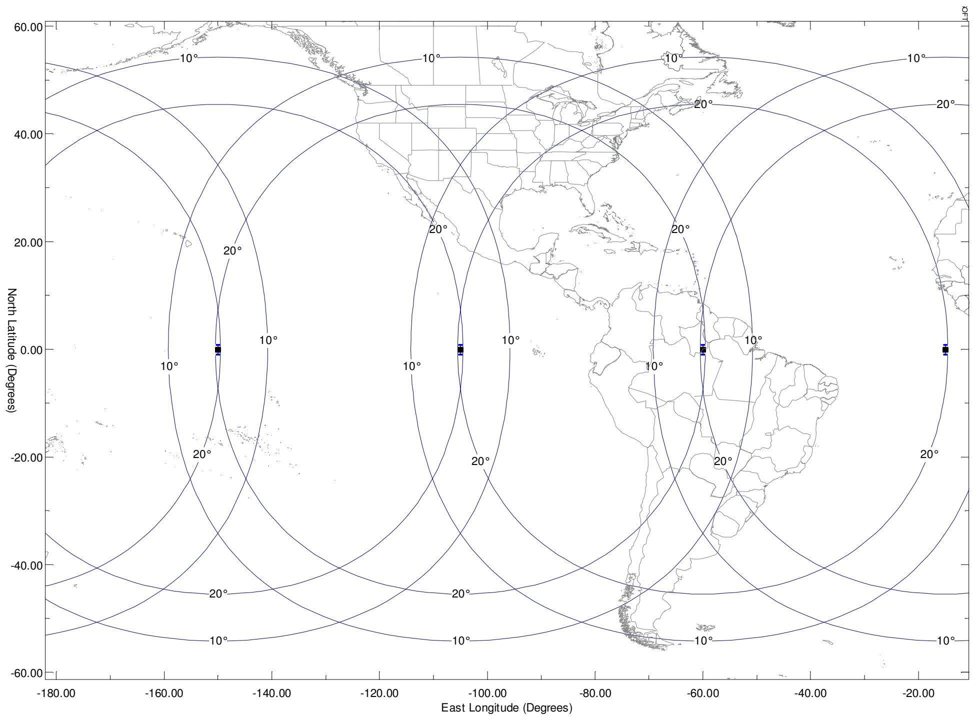
6 Several different operational scenarios can be catered for with a maximum PFD towards Hawaii of -127 dBW/m^2/MHz. For example, at low elevation angles where the spreading loss from the O3b satellite to Hawaii is 153.1 dB, the corresponding EIRP density from the O3b satellite can be 26.1 dBW/MHz (i.e., -127 + 153.1). Allowing for the 4 dB TWTA output back-off for the O3b satellite downlinks to gateways, the maximum available "linear" EIRP per TWTA is 45.7 dBW, and this only needs to be spread over 91.2 MHz to achieve the EIRP density of 26.1 dBW/MHz. In practice, therefore a single wideband 216 MHz gateway downlink carrier, or say three downlink carriers of 40 MHz each, will result in an EIRP density less than 26.1 dBW/MHz, and hence a PFD of less than -127 dBW/m^2/MHz for low elevation angles.

(i.e., -14.9+10.7). Taking the range to the GSO orbit from Hawaii corresponding to zero elevation angle (41,382.7 km) the spreading loss to the GSO would be 163.3 dB, resulting in a worst case EPFD(up) level at the GSO of -167.5 dBW/m^2/40kHz. This compares to the EPFD(up) limit value of -162 dBW/m^2/40kHz, so compliance exists with margin for this low-elevation case. At high elevation angles the increase in the separation angle between the GSO and the O3b orbit more than offsets the reduced path length to the GSO, resulting in even more margin relative to the EPFD(up) limit.

Note that the O3b satellite frequency plan includes 12 of the 20 transponders within the above listed frequency ranges where EPFD limits apply. The remaining eight transponders operate within the 28.6-29.1 GHz uplink and 18.8-19.3 GHz downlink frequency bands, which are allocated to non-GSO satellites on a primary basis according to the FCC tables of frequency allocations, with GSO satellite networks operating on a secondary basis in the 28.6-29.1 GHz range and on a non-conforming basis in the 18.8-19.3 GHz range. According to ITU procedures applicable to these frequency ranges (No. 9.11A), coordination between non-GSO and GSO networks is based on a first-come, first-served basis, depending on the ITU date priority of the relevant ITU filings. O3b is therefore actively pursuing bilateral coordination arrangements with other GSO satellite operators and their administrations concerning networks in these frequency ranges.

Even when O3b has only deployed the initial eight operational satellites, there will be a sufficient number of O3b satellites visible that it will be possible to employ satellite diversity within the O3b system. This is shown in Figure A.10-4 below which shows the instantaneous elevation angle contours (10° and 20°) from the Earth's surface to the O3b constellation of eight satellites. From this it can be seen that two or more O3b satellites are always visible with elevation angles in excess of 10° up to more than 30° in latitude, which is well beyond the latitude range where satellite diversity would be required to avoid in-line interference with respect to GSO satellites. This feature of the O3b system will permit O3b to avoid interference with respect to GSO satellite networks to and from equatorial latitudes in situations where coordination cannot be achieved by other means. As more satellites are launched into the equatorial O3b orbit the ability to employ satellite diversity in the O3b system will improve as more alternative path O3b satellites will be visible.

Figure A.10-4: Instantaneous elevation angle contours for O3b constellation (8 satellites)



A.10.2 Interference with Respect to Other Non-GSO Satellite Systems

According to ITU procedures (No. 9.12), for all of the Ka-band frequency ranges to be used by O3b, coordination between non-GSO systems and other non-GSO systems is based on a first-come, first-served basis, depending on the ITU date priority of the relevant ITU filings. O3b is therefore actively pursuing bilateral coordination arrangements with other non-GSO satellite operators and their administrations.

Under FCC rules (§25.261), sharing between non-GSO satellite systems in the 28.6-29.1 GHz uplink and 18.8-19.3 GHz downlink bands should be achievable, using whatever means can be coordinated between the operators to avoid in-line interference events, or by resorting to band segmentation in the absence of any such coordination agreement. The O3b orbit is inherently well isolated from in-line interference events with respect to certain types of other non-GSO orbits, particularly those involving highly elliptical orbit geometries, as explained further below. Also, O3b's ability to employ satellite diversity, particularly at low to medium latitudes as demonstrated in the preceding section, will allow it to share with other types of non-GSO systems. At higher latitudes, where O3b's satellite diversity capability is more limited with an 8-satellite constellation, the most likely O3b earth station type will be gateways which have very narrow beamwidths. Therefore, in these cases, the probability of interference to or from the O3b earth station, with respect to other types of non-GSO, will be extremely low and the potential periods of interference (particularly for LEOs which are moving very fast relative to the Earth surface) will be of extremely short duration. In these types of very rare situations O3b is capable of implementing a band-segmentation scheme with respect to the other non-GSO system in order to be compliant with §25.261. Therefore, O3b is confident that it can achieve the necessary coordination with other non-GSO satellite systems, as necessary.

Currently there are no other non-GSO satellite systems licensed by the Commission, or granted market access in the USA, that operate within the Ka-band frequency ranges to be used by O3b. Despite no longer being active licenses, the most recent non-GSO systems to be licensed by the Commission for operation in the O3b frequency ranges were ATCONTACT Communication's 3-satellite HEO-type non-GSO system and Northrop Grumman's 3-satellite HEO-type non-GSO system ("GESN"). From this we conclude that a likely orbit configuration for other non-GSO systems involves HEO-type orbits, and these are very compatible with the O3b orbit because there is an inherent large angular separation of the HEO and O3b orbits when viewed from the respective service areas of the two types of system, as demonstrated in more detail below.

The ATCONTACT and GESN systems have similar technical characteristics, and they are in fact identical in some key respects pertinent to the assessment of compatibility with O3b. Both of these HEO systems have a minimum operational altitude of 16,000 km, which corresponds to a minimum operational latitude of 32°N. This results in the minimum separation angle between the HEO orbit and the O3b orbit as viewed from the Earth's surface, for any possible earth station location within the visible service area of these HEO systems, of 32.7°. This angle occurs for the most southern point in the HEO service area (~20°S). For earth locations in the northern hemisphere the minimum separation angle is 43.2°. Such a large separation angle would prevent interference between O3b and such HEO-type systems.

A.10.3 Interference with Respect to Terrestrial Networks in the 17.8-18.58 GHz Band

Part of the Ka-band spectrum to be used by the O3b system is the 17.8-18.58 GHz band, which is allocated on a primary or co-primary basis, according to the US table of frequency allocations, to terrestrial fixed service ("FS") systems in the USA.[7] These systems are individually site licensed by the FCC under Parts 74F, 78 and 101 of the FCC's rules. O3b is seeking authority to use this band on a non-conforming basis, as described in the legal narrative portion of the application. As O3b is applying to the FCC for a single gateway/TT&C earth station at a remote location in US territory, the potential for interference between the O3b gateway/TT&C earth station and terrestrial FS in this band is minimal. Also, as O3b will use this frequency band in the space-to-Earth direction, the only potential interference path is from the transmitting FS station into the sidelobes of the O3b receiving earth station. Existing PFD limits in §25.208, which apply to the frequency range 18.3-18.8 GHz and to which the O3b satellites conform as demonstrated in Section A.9 of this document, are intended to adequately protect FS receivers in this band from harmful interference from satellite downlinks. As explained in Section A.9 above, the ITU PFD limits extend across the entire 17.8-18.8 GHz band with the objective of protecting terrestrial FS receivers, and therefore it can be assumed that O3b's compliance with these limits will protect FS systems across the entire 17.8-18.58 GHz band.

O3b has commissioned Comsearch to investigate in detail the existing coordination situation in the 17.8-18.58 GHz frequency band for the particular location of the planned O3b gateway/TT&C earth station at Haleiwa (also known as Sunset Beach) in Hawaii. The site was

7 Within the 18.3-18.58 GHz band, according to §101.85 of the FCC rules, terrestrial licensees are being transitioned out, but they remain co-primary in this band until November 19, 2012.

carefully selected because of its remote location and to avoid as many licensed fixed service systems as possible. The results of this are contained in Appendix B to this technical annex.

The main conclusions of this are that two in-band and two out-of-band FS links were identified as potential interference sources. Due to the distances involved and complex intersite terrain, all of these links are subject to high path losses (between 65 dB and 86 dB). Taking these predicted path losses into account the resulting interference levels are negligible. Therefore O3b considers these identified terrestrial emitters as unlikely to cause problematic interference.

Given the remote location of this O3b gateway/TT&C earth station it is unlikely that there will be significant additional FS activity in the future in the vicinity of this earth station that will create any interference problems into the O3b earth station. However, in the unlikely event that potential interference is caused to the O3b earth station by increased FS activity in the area, O3b will accept any such interference and take the necessary measures to prevent it from impacting the O3b operations. Such necessary technical measures may include adjusting the minimum operational elevation angles, frequency avoidance, power level adjustment, earth station shielding or some combination thereof.

A.10.4 Interference with Respect to Terrestrial Networks in the 27.6-28.35 GHz Band

The O3b system also uses the 27.6-28.35 GHz band which is allocated by the Commission's 28 GHz First Report and Order, to the terrestrial LMDS (Local Multipoint Distribution System) service on a primary basis and to the fixed-satellite service on a secondary basis in the USA.[8] These systems are licensed by the FCC on a geographic area basis. As O3b is applying to the FCC for a single gateway/TT&C earth station on a secondary basis at a remote location in US

---

[8] *See* Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Service, *First Report and Order and Fourth Notice of Proposed Rulemaking*, CC Docket No. 92-297, 11 FCC Rcd 19005 (1996) (*28 GHz First Report and Order*).

territory, the potential for interference between the O3b gateway/TT&C earth station and the LMDS service in this band is minimal. Also, as O3b will use this frequency band in the Earth-to-space direction with a minimum uplink elevation of 5°, the only potential interference path is from the sidelobes of the transmitting O3b earth station into the LMDS receivers.

Regarding §2.105(c)(2)(i), uplinks from gateway earth stations that are located in the United States must be operated in a manner such that they do not cause harmful interference to any current or future licensed LMDS station. O3b has therefore commissioned Comsearch to also investigate in detail the existing coordination situation in the 27.6-28.35 GHz frequency band for the particular location of the planned O3b gateway/TT&C earth station at Haleiwa in Hawaii.

Comsearch identified four active LMDS license holders whose service areas fall within the coordination contours of the planned O3b earth station in Haleiwa. On behalf of O3b, Comsearch issued a coordination notice to these licensees declaring O3b's intention of establishing a satellite uplink which operates within LMDS spectrum and in their stated region of operation. At the end of the 30 day reply window none of the applicants replied to Comsearch or directly to O3b. Based on this coordination result it has been determined that there are no affected LMDS systems at the present time.

Currently there is no designated "coordinator" for the LMDS frequency bands. Until such time as a coordinator is established, O3b will monitor the licensing of LMDS spectrum by the FCC and contact any new LMDS licensees that might be affected by O3b's use of the LMDS primary spectrum, to establish whether there is an interference issue or not. Eventually it can be assumed that a coordinator will be established for the LMDS band, and then O3b will become part of the ongoing coordination efforts for other entities seeking to establish in-band operations.

In the unlikely event that LMDS links are planned to be implemented in the vicinity of the O3b earth station such that they would be interfered with by the transmitting O3b earth station, O3b will work cooperatively with these licensees to ensure O3b uplink operations will not negatively impact LMDS users. O3b will also be prepared to take necessary technical measures to avoid harmful interference such as adjusting the transmit elevation angles, frequency avoidance, uplink power adjustment, earth station shielding, or some combination thereof.

§2.105(c)(2)(ii) requires O3b, as a secondary user, to accept incoming interference from a primary user. Transmitting LMDS stations cannot cause harmful interference into the O3b receiving earth station since the earth station does not receive transmissions in the 27.6-28.35 GHz band. Harmful interference occurring from the aggregation of transmitting LMDS stations into a receiving spot beam of the satellite is considered to be very unlikely; however O3b undertakes to accept this risk and will not seek protection from such interference in the event it occurs.

A.11 ITU Filing for O3b

The O3b satellite system is registered with the ITU by the United Kingdom administration. The Advance Publication Information ("API") filing was submitted to the ITU on 23 October 2007 and published in IFIC 2608 on 27 November 2007 as API/A/4800. The Coordination Request ("CR") filing was submitted to the ITU on 24 April 2008 and published in IFIC 2626 on 19 August 2008 as CR/C/2209 and in IFIC 2632 on 11 November 2008 as CR/C/2209 MOD-1.

A.12 Coordination with the US Government Satellite Networks (Footnote US334 in the FCC Table of Frequency Allocations)

US334 requires coordination of the O3b system with US government satellite networks, both GSO and non-GSO.

Coordination between the O3B-A non-GSO satellite system, as filed with the ITU and as described in this application, and the US government satellite networks (including both GSO and non-GSO networks, as well as their associated specific earth stations filed under 9.7A and 9.7B of the ITU Radio Regulations through other administrations) has been formally completed and the FCC is in possession of the confidential coordination agreement.

A.13 Orbital Debris Mitigation Plan
(§25.114(d)(14))

The O3b satellites have been designed and are being built by Thales using a derivative of its spacecraft bus used for Globalstar. Except with respect to the safe flight profile, the information provided below concerning the orbital debris mitigation plan has therefore been provided by Thales (at O3b's request).

A.13.1 Debris Release Assessment
(§25.114(d)(14)(i))

Thales has assessed the launch, orbit raising, deployment and normal operations portions of the mission and determined that no debris will be released in a planned manner by the spacecraft.

Thales has assessed and limited the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal. Specifically, to protect the spacecraft from small body collisions, the design of the O3b spacecraft allows for individual faults without losing the entire spacecraft. All critical components (i.e., computers, battery, fuel tank and control devices) are built within the structure and shielded from external influences. Items that cannot be built within the spacecraft nor shielded (like antennas) are redundant and/or are able to withstand impact. The O3b spacecraft can be controlled through two wide angle spacecraft antennas providing nearly 4π steradian coverage to an earth station. The likelihood of both wide angle antennas being damaged during a small body collision is minimal. There is one set on each side of the spacecraft; either set could be used to successfully de-orbit the spacecraft.

A.13.2 Accidental Explosion Assessment
(§25.114(d)(14)(ii) and §25.283(c))

Thales has assessed and limited the probability of accidental explosions during and after completion of mission operations. Thales has reviewed failure modes for all equipment to assess the possibility of an accidental explosion onboard the spacecraft. In order to ensure that the spacecraft does not explode on orbit, *e.g.*, from the conversion of energy sources on board the spacecraft, the satellite controller will take specific precautions. The battery and fuel tanks will be monitored for pressure or temperature variations. Alarms in the Satellite Control Center ("SCC") will inform controllers of any variations. Additionally, long term trending analysis will be performed to monitor for any unexpected trends.

Operationally, batteries will be operated utilizing the manufacturer's automatic recharging scheme. Doing so will ensure that charging terminates normally without building up additional heat and pressure. As this process occurs wholly within the spacecraft, it also affords protection from command link failures (on the ground).

In order to protect the propulsion system, fuel tanks will all be operated in a blowdown mode. This will cause the pressure in the tanks to decrease over the life of the spacecraft. The blowdown system eliminates the need for a pressure regulator and the subsequent risk of over-pressurizing the relatively low pressure fuel tank.

In order to ensure that the spacecraft has no explosive risk after it has been successfully maneuvered to the graveyard orbit, all stored energy onboard the spacecraft will be discharged to the maximum extent possible and the residual fuel will be depleted. Upon successful de-orbit of the spacecraft, all propulsion lines and latch valves will be vented. All battery chargers will be turned off and batteries will be left in a permanent discharge state. These steps will ensure that no buildup of energy can occur resulting in an explosion in the years after the spacecraft is de-orbited.

O3b satellites, in keeping with typical LEO and MEO satellites that are smaller than their GSO counterparts, will utilize a monopropellant blowdown propulsion system that has diaphragm propellant tanks with a membrane between the pressurant and the propellant. At the end-of-life of each O3b satellite, all of the propellant in the tank will be expelled but a small amount of pressurant will remain in the propellant tank (about 100 psia) that cannot be vented. To the extent one is required, O3b respectfully requests a waiver of Section 25.283(c) of the

Commission's rules. While the residual pressurant in the propellant tank cannot be vented, it poses no risk of explosion for the spacecraft following post-mission disposal due to spacecraft design. The remaining pressure is only about 1/6th of the propellant tank qualification burst pressure, 1/150th of the qualification burst pressure of the tubing and welds, and 1/12th of the valve qualification burst pressure, thereby providing ample safety margin. The propellant tanks are also shielded from external fracture from small debris.

A.13.3 Safe Flight Profiles (§25.114(d)(14)(iii))

O3b has assessed and limited the probability of its satellites becoming a source of debris by collisions with large debris or other operational space stations. The operational orbit to be used by the O3b system (8,062 km above the Equator), allowing for the practical orbit-keeping tolerances that are stated below, will not cross the orbit of any other registered or known space object, including large debris, and therefore there is no risk of collision with such objects. There are no known MEO systems orbits that are the same as or similar to O3b's operational orbit. The ICO F2 satellite is in a non-Equatorial orbit of more than 10,000 km above the Earth, while the GPS, Glonass and Galileo MEO systems are (or will be) in non-Equatorial orbits more than 19,000 km above the Earth. O3b will continue to monitor the existence of space objects to ensure that this favorable situation continues, and will take all necessary action to avoid the possibility of in-orbit collision if such risk presents itself due to new space objects.

The O3b satellites will be maintained in their operational orbit throughout their operational lifetime using on-board fuel that will be used to effect small adjustments to the orbit to compensate for natural orbit drift. The accuracies with which the orbital parameters of the O3b spacecraft will be maintained, while in their operational orbit, are as follows:

- Apogee: +5.05/-0.00 km (derived)
- Perigee: +0.00/-5.05 km (derived)
- Inclination: <0.1 degree per specification
- Eccentricity: +0.00035/-0.0 per analysis

A.13.4 Post Mission Disposal Plan (§25.114(d)(14)(iv))

The O3b satellites are in an operational orbit defined by the NASA Guidelines for Post Mission Disposal of Space Structures (NSS 1740.14 Section 6) as semi-synchronous and by FCC guidelines (FCC 04-130 Paragraphs 84-88 for non-GSO spacecraft) as those that are not LEO or GEO. To comply with the NASA and FCC guidelines, the O3b satellites are designed to be maneuvered to an end-of-life disposal orbit that is stable for at least 100 years and not interfere with the orbits of operating spacecraft. Thus, the end-of-life orbit disposal orbit is to be of near equatorial inclination, and at a sufficiently different orbit altitude, either lower than 7950 km or higher than 8150 km, so as to prevent O3b satellites that have reached their end of life from re-crossing of the O3b operational orbit altitude of 8062 km over a period of at least 100 years. In addition, the disposal orbit altitude and inclination should be selected to prevent crossing of current and future known MEO operational systems including Galileo, GPS, and Glonass.

O3b has selected the following orbit for end-of-life disposal to meet these requirements:

- Initial disposal orbit altitude: ~8195 km
- Initial disposal orbit eccentricity: < 0.005
- Initial disposal orbit inclination: < 0.1 deg

Figures A.13-1 through A.13-4 demonstrate the stability of the disposal orbit over a 100 year period by illustrating the free evolution of the disposal orbit semi-major axis, apogee and perigee, eccentricity and inclination. As can be seen, the selected orbit is very stable and creates no possibility of collision with the GPS, Galileo or Glonass MEO systems which are (or will be) all above 19000 km in altitude and inclined above 55 degrees. The proposed disposal orbit also poses no threat of collision with the ICO F2 satellite, which is operating at altitudes above 10,000 km at an inclination of about 45 degrees. The disposal orbit will never decay to the LEO orbit range nor will it approach the GSO.

The spacecraft mass at the beginning of the disposal period will be ~600kg, and this will require 8 kg of fuel for the end-of-life maneuvers to achieve the disposal orbit. At the end-of-life the satellite has an estimated fuel margin of 63 kg thereby providing ample allowance for the end-of-life maneuvers taking into account a worst case end of life gauging uncertainty of 11 kg.

To reliably perform the maneuver, each satellite will have a reliability of >0.95 for the equipment required to successfully perform the maneuvers at end-of-life.

Figure A.13-1: Free evolution of disposal orbit semi-major axis demonstrating long term stability

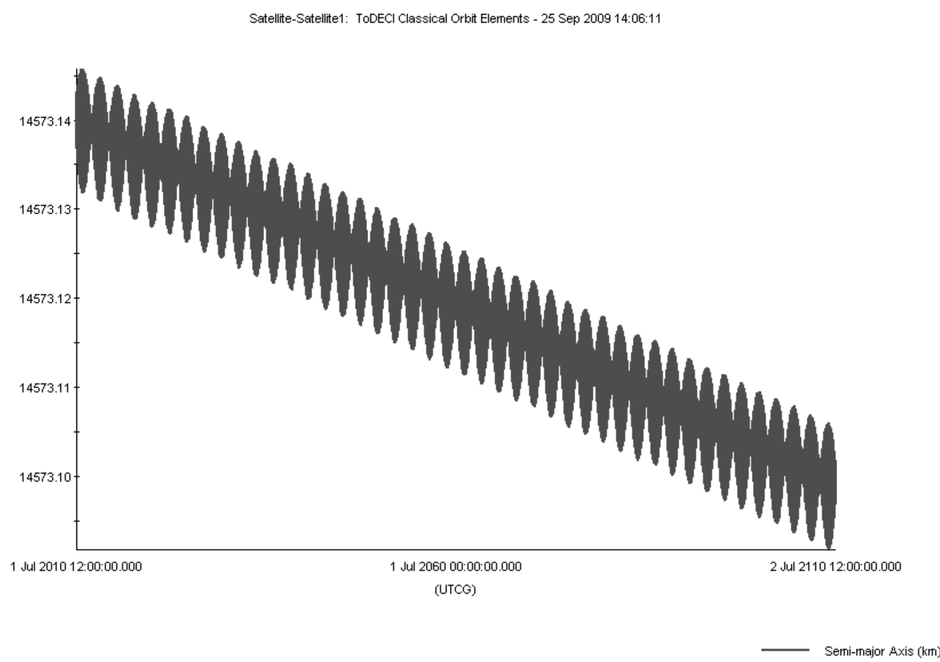


Figure A.13-2: Free evolution of disposal orbit apogee and perigee demonstrating long term stability

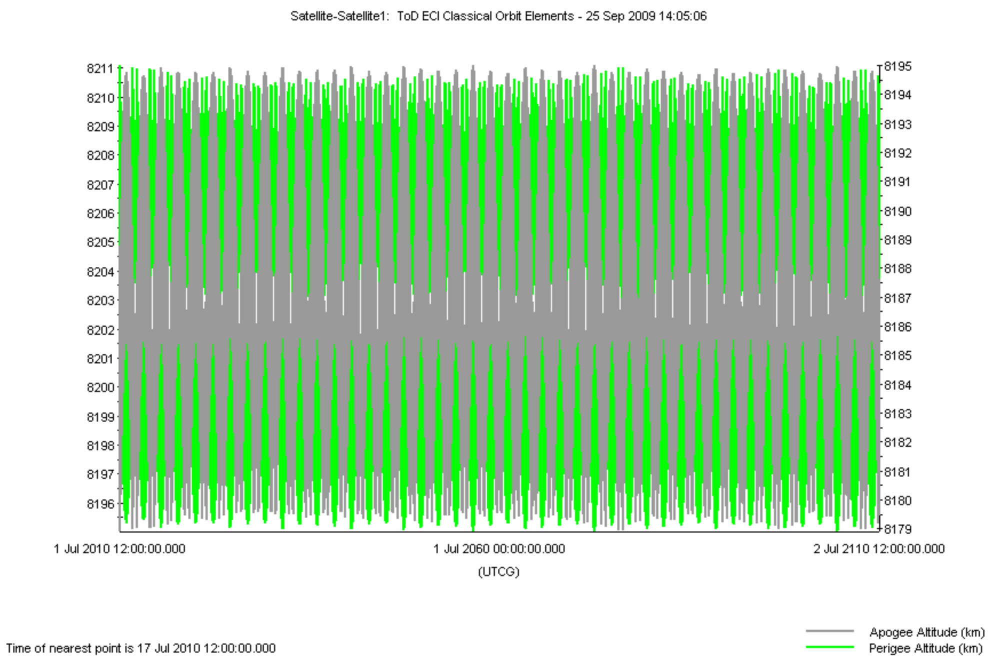


Figure A.13-3: Free evolution of disposal orbit eccentricity demonstrating long term stability

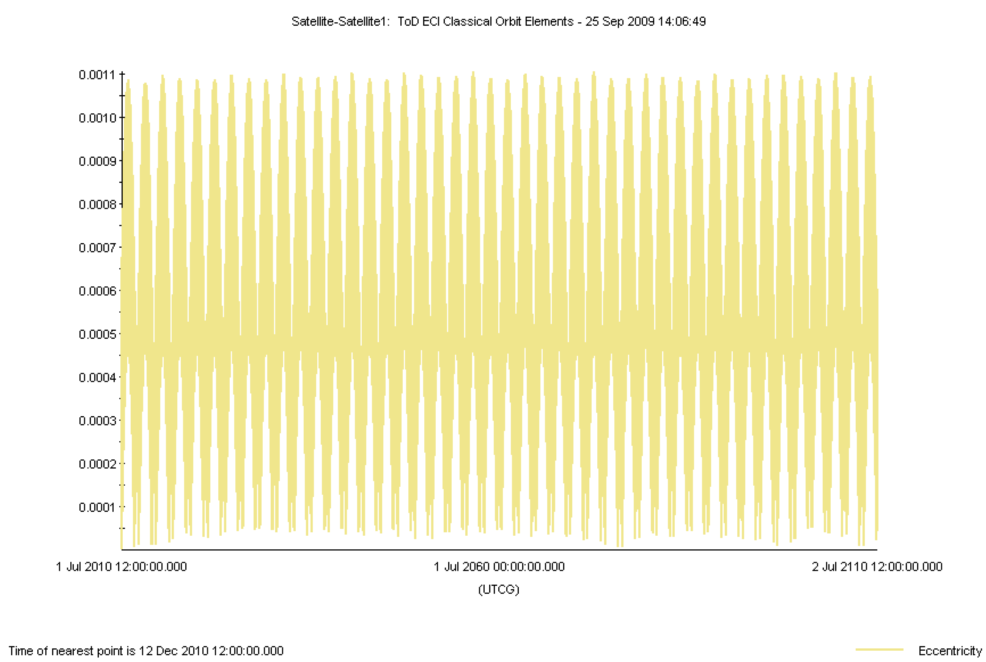
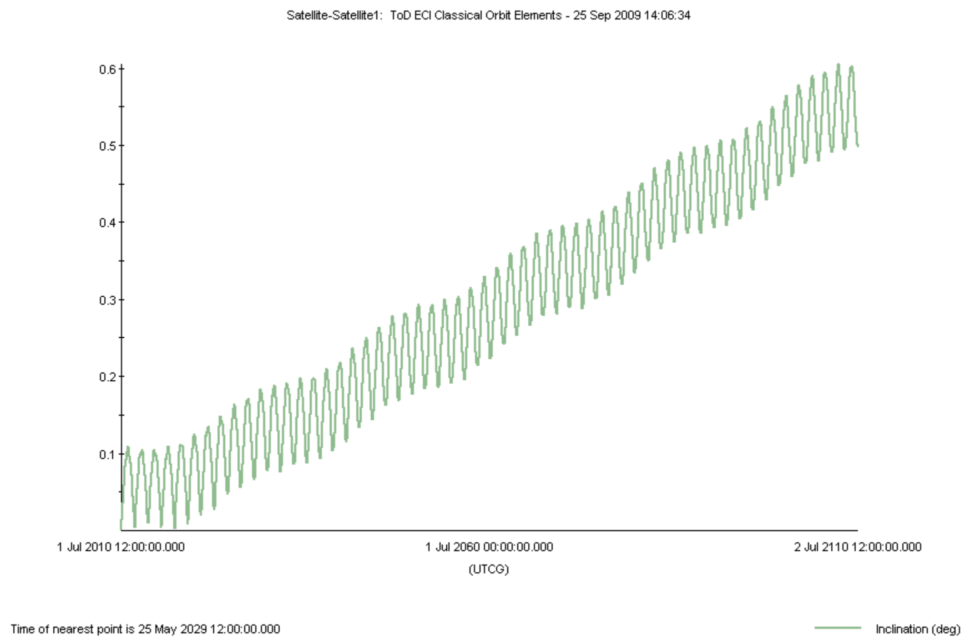


Figure A.13-4: Free evolution of disposal orbit inclination demonstrating long term stability



A.14 Cross-Polar Isolation of the Satellite Antennas (§25.210(i)(1))

Section S7 of the associated Schedule S submission states that the minimum cross-polar isolation ("XPI") of the O3b satellite transmit and receive antennas is 18.5 dB. This is less than the 30 dB requirement stated in §25.210(i)(1). This is a result of the unconventional O3b satellite and system design which results in inevitable compromises in certain aspects to achieve overall optimum performance. The shortfall in the XPI relative to §25.210(i)(1) will not be a problem for O3b or other users of the spectrum for the following reasons:

(i) The XPI value of 18.5 dB is the worst case value for either of the gateway beams that will be used to communicate with the US gateway/TT&C earth stations. This minimum value occurs only in limited geographic areas and only for certain limited pointing directions of the beam.

(ii) For O3b's own links this level of XPI performance has been taken into account and there will be negligible degradation to service quality. Because of the nature of the ACM, during the short periods where the antenna XPI performance might degrade the link the ACM scheme is able to make a slight reduction in data rate to compensate, but this will have minimal impact on the overall average data rate, and will not impact the available data rates offered at higher availabilities. This degradation due to XPI will be so small as to still allow for a very efficient 8PSK modulation scheme to be used during these periods.

(iii) The XPI performance will not prevent full frequency re-use of the spectrum from being achieved, as required by §25.210(d).

(iv) As the O3b system uses both senses of circular polarization (RHCP and LHCP) then there is no scenario where a certain level of XPI performance would achieve interference isolation between the O3b system and any other space or terrestrial systems. It is the co-polar transmissions that will dictate the interference levels to and from other systems, not the level of cross-polar radiation.

(v) The only situation where the XPI performance of a satellite antenna can impact the interference between satellite networks (GSO or non-GSO), or between satellite and terrestrial systems, is when the associated earth station (or terrestrial terminal) has its antenna pointed directly at the interfering or interfered-with satellite. Only then is the polarization purity of the earth station high enough for the XPI of the satellite antenna to be a significant factor on the interference level. In all interference situations where the satellite is located at some angle away from the boresight of the earth station (or terrestrial terminal) the very poor XPI of the earth station (or terrestrial terminal) dominates the interference calculation. This latter situation is the case for all interference interaction between the O3b system and other GSO networks or terrestrial systems. Therefore the shortfall in XPI for the O3b satellite antenna will have no impact on the interference to or from other networks and systems.

O3b therefore respectfully requests a waiver of the Commission's rule concerning XPI (§25.210(i)(1)) on the basis that it will not be a problem for O3b or impact any other user of the spectrum.

A.15 Additional Information Concerning Certain Data in the Associated Schedule S

Due to limitations in the permitted data for certain fields in the Schedule S software, it has not been possible to enter the requested values, as follows:

- The value inserted in tab S7, column D ("No of Phases") represents the number of different phase and/or amplitude states in the case of modulation schemes such as 16APSK which include both amplitude and phase modulation.

APPENDIX A

O3b Spacecraft Reconfigurability

The normal operating configuration of the O3b spacecraft is with two gateway beams that are each connected to five user beams. The gateway-to-user link is designated the "Forward" link and the user-to-gateway link is designated the "Return" link. This standard configuration is shown in the first two rows of Table A-1 below. Other spacecraft configurations are shown in the rows following which allow for up to four of the (normally user) beams to be configured as gateway beams to provide greater flexibility to address different traffic requirements. Whenever one of these flexible beams is configured as a gateway beam then there is one less user beam available. These additional gateway configuration possibilities, in terms of connectivity between gateway and user beams, are shown in rows 3 to 6 of Table A-1 below, resulting in a maximum of six gateway beams that can be operated, with each one connected to one user beam. An additional capability is denoted in Table A-1 where up to four of the user beams may be connected back to themselves to provide intra-beam connectivity. All of the possible configurations shown in Table A-1 are captured in Tab S10 of the associated Schedule S.

Table A-1: Gateway-to-user beam configuration possibilities for each O3b satellite

		User beams									
		1*	2	3*	4	5*	6	7	8*	9	10
Gateway beams	1	X	X	X	X	X					
	2						X	X	X	X	X
	3				X	X		X			
	4			X				X			
	5								X		
	6				X						

Notes:

1. An "X" in the above table indicates a possible connectivity between gateway and user beams.
2. Normal mode of operation consists of the first two rows of the table only.
3. Designated User beams denoted with "*" may be connected back to the same antenna with no gateway connectivity

APPENDIX B

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

REPORT TITLE:			
Summary of Hawaii Gateway Coordination & Interference Study			
PREPARED BY: Gary Mattie	DATE 10 Jun 2010	APPROVED BY: Jay Bloom	DATE 10 Jun 2010

SCOPE/TEXT (ATTACH ADDITIONAL SHEETS AS REQUIRED)

Executive Summary:

In March 2010, O3b commissioned Comsearch to provide interference analysis and frequency coordination services for a potential O3b Gateway site on the island of Oahu at the SES Sunset Beach Teleport facility east of Haleiwa, Hawaii. The names Haleiwa and Sunset Beach are used interchangeably throughout this document and the attached Exhibits.

The interference study revealed two in-band links and two out-of-band links with very high terrain losses present. These links will not impact O3b downlink operations (details contained herein).

Comsearch issued a “28 GHz LMDS band Coordination Notice” to the licensees previously identified for this market. To date, no objections have been received.

The Haleiwa site is considered a ***viable*** *O3b Gateway location from an interference and coordination perspective.*

Appendix B Exhibit 1: *Comsearch Interference Analysis (18/28 GHz)*

Appendix B Exhibit 2: *Comsearch Frequency Coordination Report (28 GHz)*

Non-Technical Data. Authorized for Export.

DISTRIBUTION

B. Holz J. Bloom S. Blumenthal G.Mattie M. Carpenter	J.Mowat K.Mentasti		

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

1 Analysis Inputs

Comsearch was given technical parameters for the potential O3b Gateway. Key parameters included the gain and pattern mask for the Viasat 7.3m MEO Tracking Antennas and the uplink carrier density as radiated towards terrestrial locations.

- carrier density for the interference objective was -156 dBW/1 MHz
- Antenna Model used was “FCC REFERENCE 32–25 Log θ”
- 3 degree minimum analysis elevation (normal operations are >5 degrees elevation)
- Great Circle coordination distances = 241.1 mi (18 GHz) & 164.8 mi (28 GHz)

Receive Channels

18112.0 – 18328.0
18372.0 – 18588.0
18801.0 – 19017.0
19055.0 – 19271.0
19296.6 – 19299.6

Transmit Channels

27652.0 – 27868.0
27912.0 – 28128.0
28172.0 – 28388.0
28601.0 – 28817.0
28855.0 – 29071.0
29088.5

As viewed from a stationary position on Oahu, Hawaii, the motion of the O3b MEO satellite constellation presents the tracking arc shown in Figure 1 below.

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

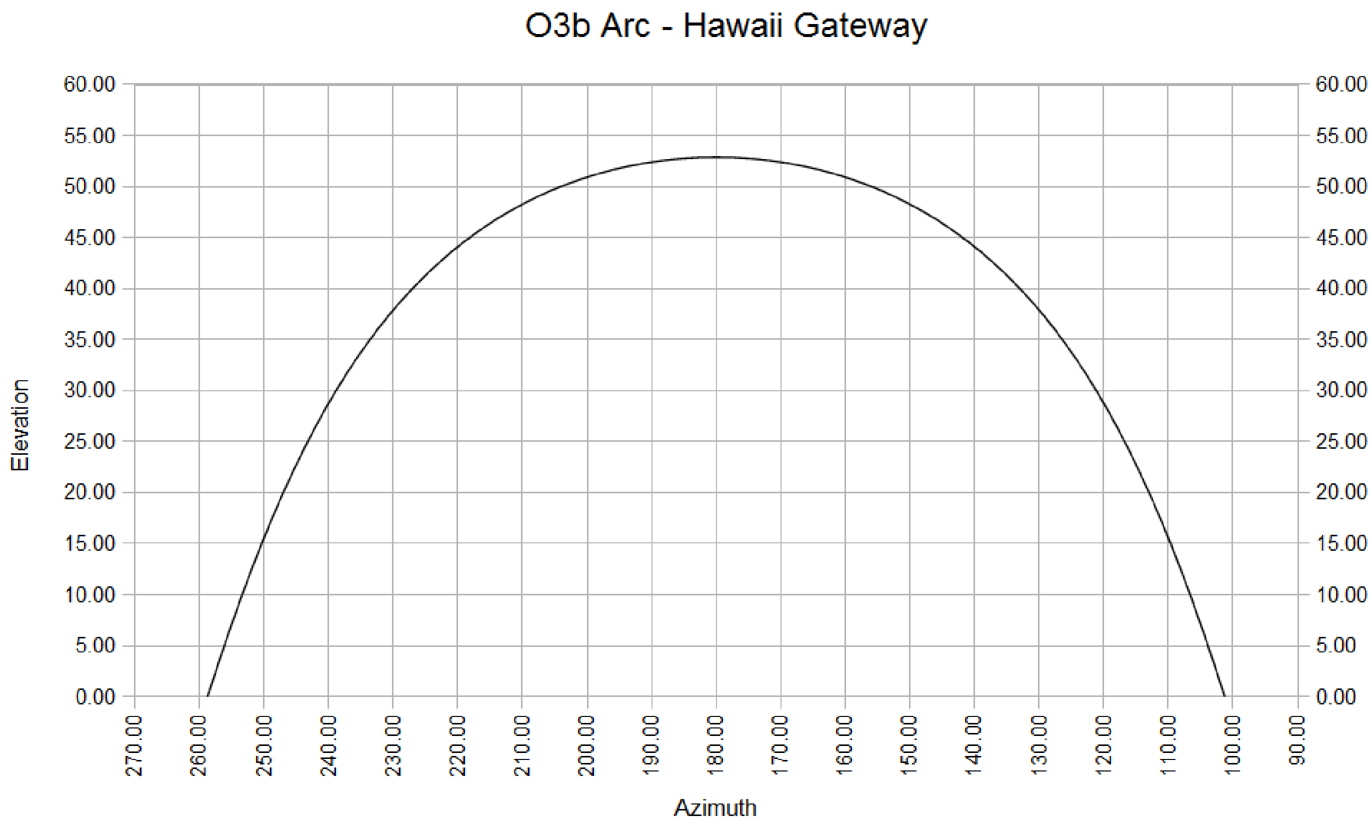


Figure 1: O3b Tracking Geometry

Comsearch was given the tracking arc data and incorporated ground antenna pointing geometry into the interference analysis.

2 Results

Downlink Band – 18 GHz

Comsearch's 18 GHz analysis identified four cases with **none** of the cases presenting interference potential:

Case 1: WQJC836	T-Mobile	19455 MHz	28.4 dB above Line of Sight threshold
Case 2: WQEW560	T-Mobile	19515 MHz	2.8 dB above Line of Sight threshold
Case 3: WQJY737	Coral Wireless	18065–18115 MHz	2.4 dB above Line of Sight threshold (70' ant. height)
Case 4: WQJY737	Coral Wireless	18065–18115 MHz	2.4 dB above Line of Sight threshold (135' ant. height)

Details on the above cases are described in the following sections.

Uplink Band – 28 GHz

Comsearch's 28 GHz analysis identified four LMDS Block A licenses:

- BTA Associates LLC	Market BTA192	Honolulu, HI
- BTA Associates LLC	Market BTA190	Hilo, HI
- BTA Associates LLC	Market BTA222	Kahului-Wailuku-Lahaina, HI
- Lakedale Link, Inc	Market BTA254	Lihue, HI

Comsearch also identified five Common Carrier Fixed Microwave Licensees authorized for temporary fixed operations from 27.5 – 29.5 GHz in the State of Hawaii or nationwide:

- GTE Southwest Inc. dba Verizon Southwest
- Hawaiian Telcom
- Metronet Communications
- Princeton Scientific Capital Management Corp.
- Verizon West Virginia Inc.

One local television transmission licensee authorized for temporary fixed operations from 27.5 – 29.5 GHz on a nationwide basis was identified:

- Information Super Station, LLC

All incumbent licensees were sent a coordination notice, technical data, and O3b contact information. To date, **none** of the licensee have responded. Potential mitigation techniques regarding future 18/28 GHz coordination issues are contained in Sections 6 & 7 of this report.

3 Case 1 – WQJC836 (18 GHz)

In addition to searching the provided frequency ranges, Comsearch's analysis tool performs an extended spectrum search to identify inter-channel and adjacent band carriers which may impact ground terminal system performance. These are not necessarily interference sources but their transmit power may appear in the passband of the terminal and could impact the RF performance of the receive system.

Case 1 is a 9M80G7W link operating 155 MHz above the O3b band edge of 19.3 GHz. Figure 3 below shows this to be a relatively short point to point link on the neighboring island of Kauai. The distance from the emitter to the O3b site is >165 km and the orientation is perpendicular to most of the O3b tracking arc.

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

Figure 2: Case 1 Overhead Image

The numbered radials on the image above indicates the azimuth by radial alignment and the elevation angle at the respective azimuth for the O3b earth station antenna. The maximum elevation is at an azimuth of 180 degrees and has an elevation of 52.8°.

Orientation of the path and the lower elevation angles of the Gateway antenna contributes greatly to the predicted signal level which would be above the interference threshold by an appreciable *28.6 dB if it were a line of sight path*.

The Comsearch terrain profile in Figure 4 below shows significant propagation impediments are present, causing the potentially interfering transmitter to be blocked by the high elevation terrain between it and the Sunset Beach location.

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

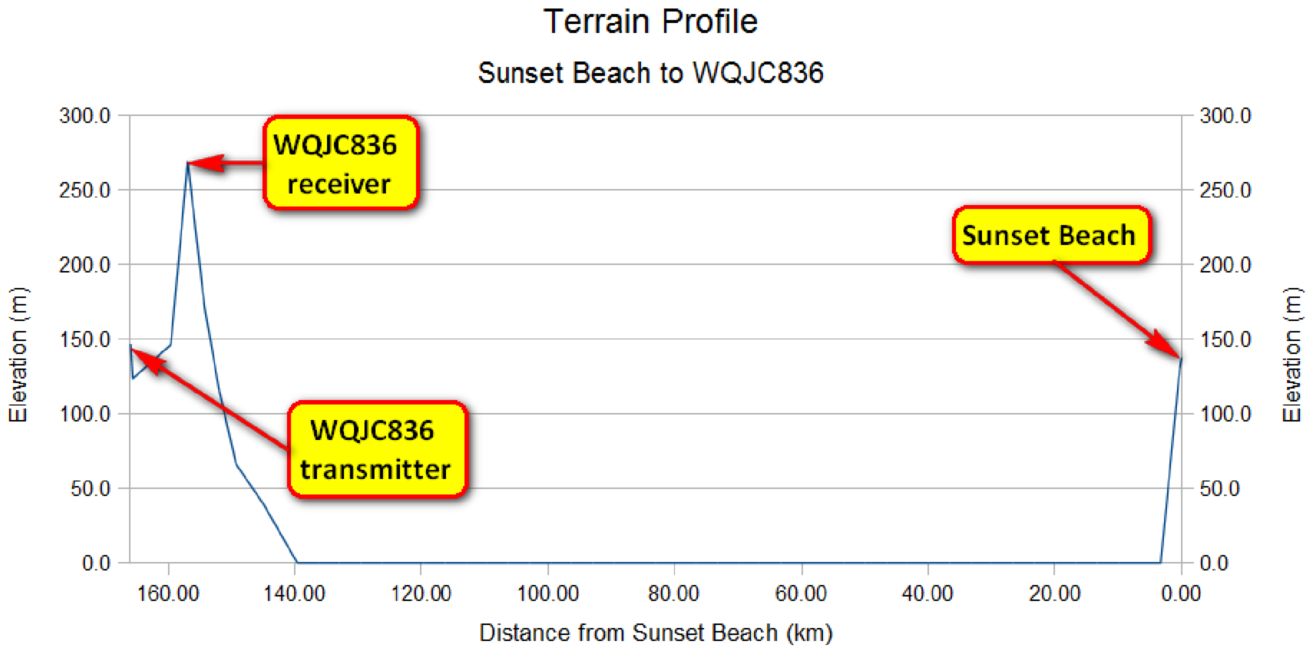


Figure 3: Case 1 Terrain Profile

The additional 'Over the Horizon' losses (which include the curvature of the earth & terrain) are predicted to be 65.3 dB.

Threshold Line of Sight Margin:	-28.4 dB
Over the Horizon Losses:	65.3 dB
Net Threshold Margin:	**36.9 dB**

Therefore this carrier is not a direct interference source and does not present dynamic range or intermodulation distortion impacts to the Gateway.

4 Case 2 – WQEW560 (18 GHz)

Case 2 is another out of band carrier that has been identified by the Comsearch analysis. This is a 4M90G7W link operating 215 MHz above the 19.3 GHz O3b band edge.

Figure 5 below shows this is a point to point link operating on the southeast corner of Oahu. The distance from the emitter to the proposed O3b Gateway is 53.3 km and the orientation is aligned with a Gateway antenna elevation of 42.5° on the setting side of the O3b tracking arc.

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

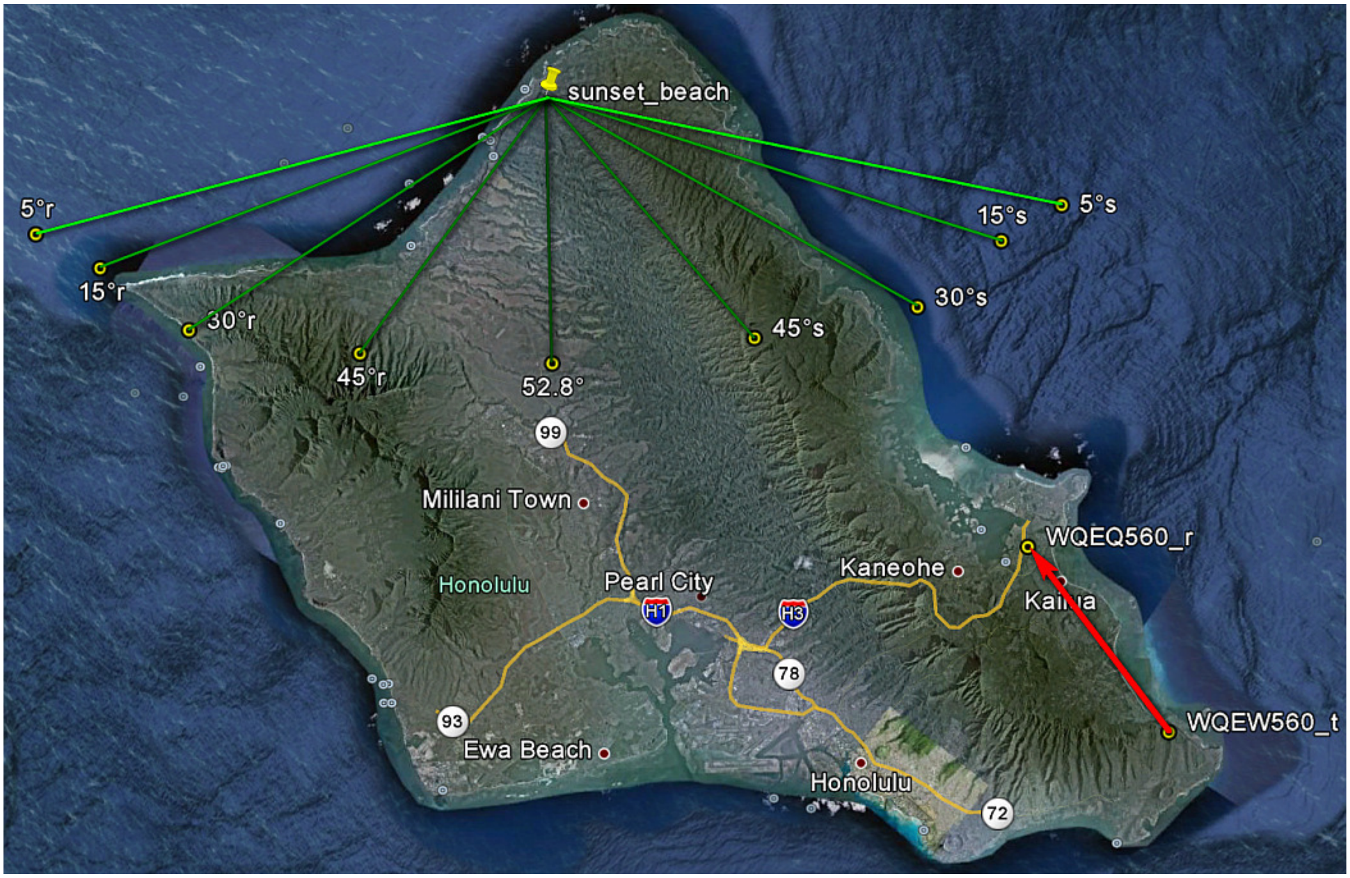


Figure 4: Case 2 Overhead Image

The numbered radials on the image above indicate the azimuth by radial orientation and the elevations angle at respective azimuth, for the O3b earth station antenna. The "r" indicates the rising or ascending portion of the contact and the "s" denotes the setting or descending portion of the contact.

The terrain model from Comsearch (see Figure 6 below) and a Google maps image looking Northwest (see Figure 7 below) show this to be a complex path consisting of a bay area and 800m hills.

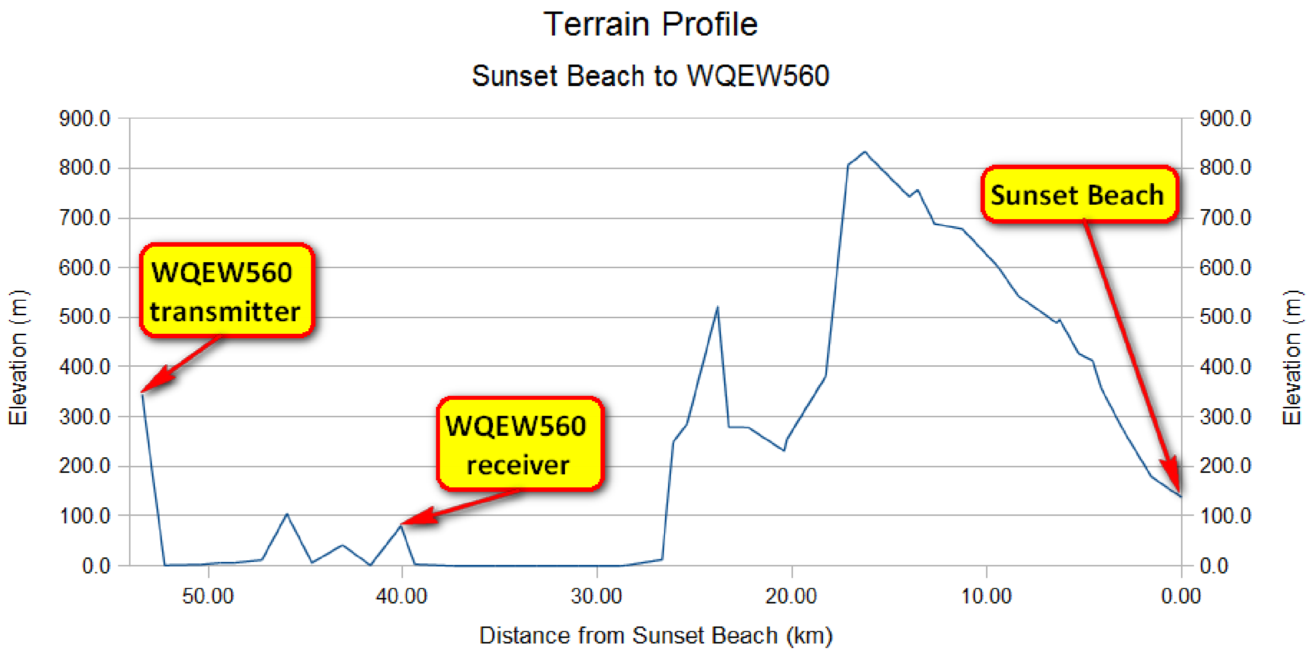


Figure 5: Case 2 Terrain Profile

Fig

Figure 6: Case 2 3D Overhead Image

The terrain effects along this signal path coupled with O3b tracking antenna geometry and the relatively short transmitter to receiver path reduces the predicted signal level of the out-of-band WQEW560 carrier.

The 'Over the Horizon' terrain losses between the transmitter and the Sunset Beach location are predicted to be 86.2 dB:

Threshold Line of Sight Margin:	-2.8 dB
Over the Horizon Losses:	86.2 dB
Net Threshold Margin:	**83.4 dB**

Therefore this carrier is not a direct interference source and will not present dynamic range or intermodulation distortion impacts to the Gateway.

5 Case 3 & 4 – WQJY737 (18 GHz)

Cases 3 & 4 *were* two 50M0D7W links operating from two different antenna heights on a building located near the Honolulu airport (see Figure 8 below). FCC File Number 0003967483 shows this link has been reconfigured to an 11 GHz channel which removes this carrier from the O3b passband. The Comsearch analysis includes such entries due to the 18 month buildout allowance and therefore assumes that this carrier could still be present upon O3b service activation.

The distance from the emitter to the proposed O3b Gateway is 39.1 km and the orientation is aligned with a Gateway antenna elevation of 51° on the setting side of the O3b tracking arc.

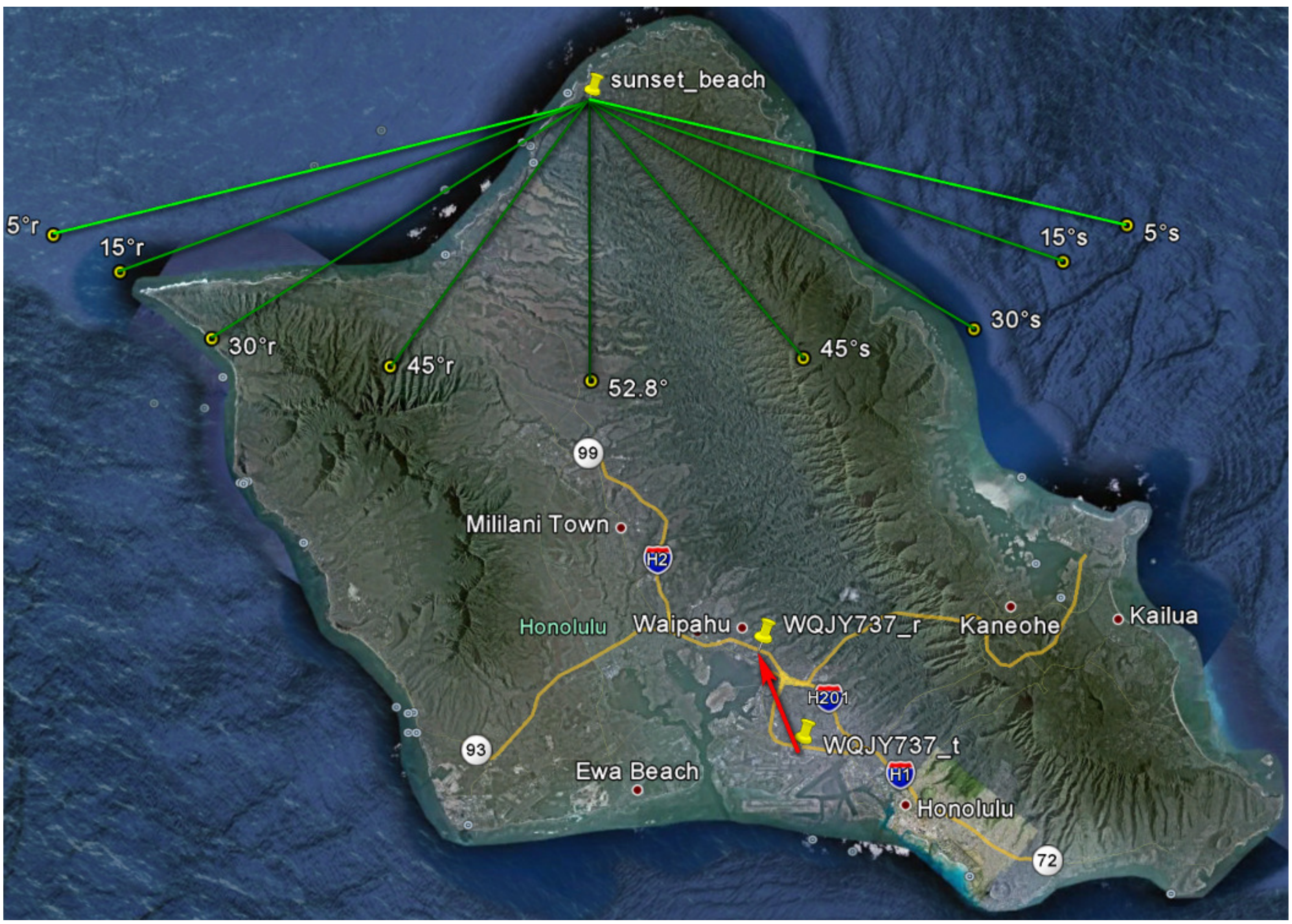


Figure 7: Cases 3 & 4 Overhead Image

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

The numbered radials on the image above indicate the azimuth by radial orientation and the elevation angle at the respective azimuth for the O3b earth station antenna. The "r" indicates the rising or ascending portion of the contact and the "s" denotes the setting or descending portion of the contact.

The terrain model from Comsearch (see Figure 9 below) and a Google maps image looking Northeast (see Figure 10 below) show this to be a mixed geography path consisting of the Honolulu city basin and an extended range of interior hills which exceed 400m in elevation.

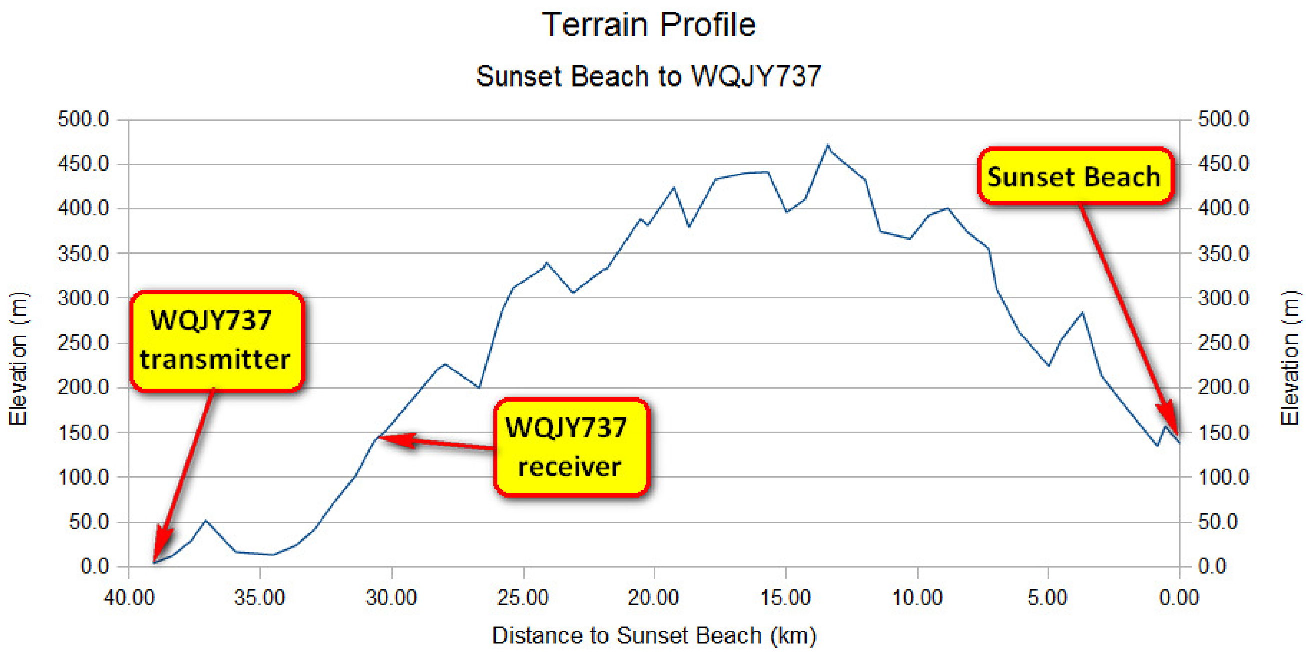


Figure 8: Cases 3 & 4 Terrain Profile

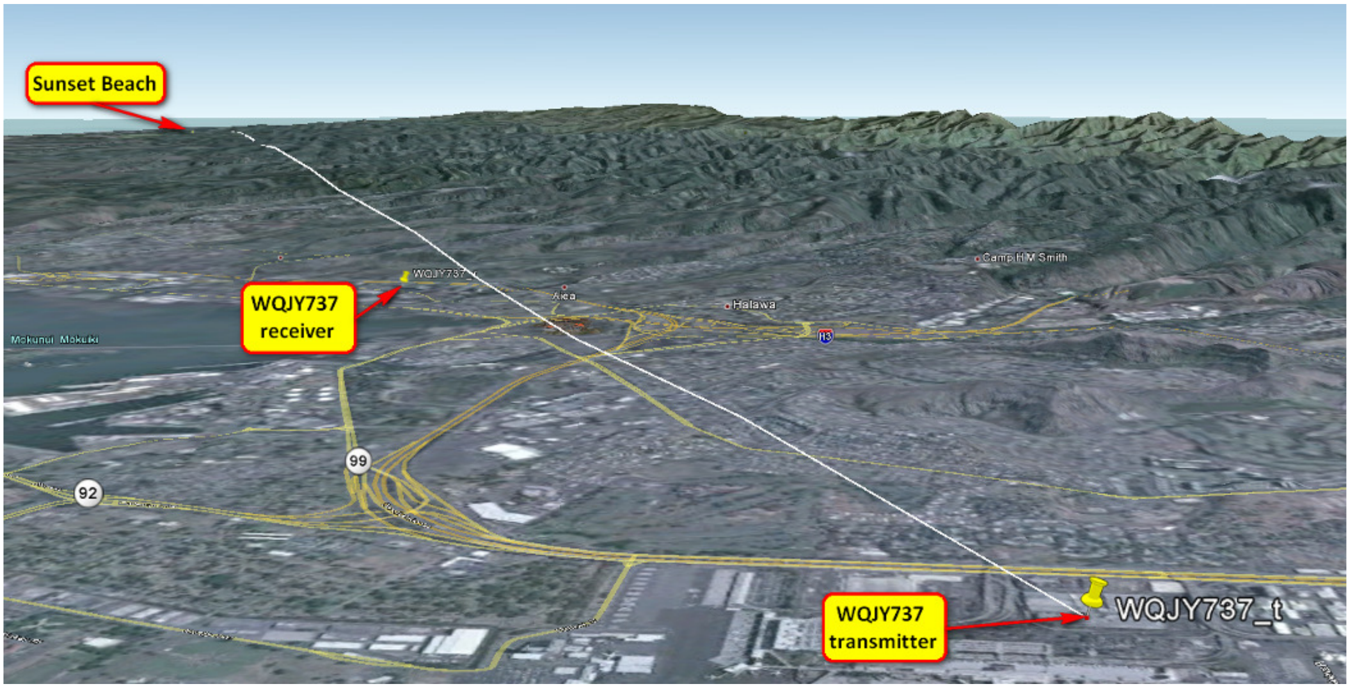


Figure 9: Cases 3 & 4 3D Overhead Image

The terrain effects along this path coupled with O3b tracking antenna geometry and the relatively short transmitter to receiver path reduces the predicted signal level of the out-of-band WQJY737 carrier.

The predicted 'Over the Horizon' losses are 76.2 dB and 80.1 dB for the High and Low WQJY737 antennas respectively:

Case 3:	Threshold Line of Sight Margin:	-2.8 dB
	Over the Horizon Losses:	76.2 dB
	Net Threshold Margin:	**73.4 dB**
Case 4:	Threshold Line of Sight Margin:	-2.8 dB
	Over the Horizon Losses:	80.1 dB
	Net Threshold Margin:	**77.3 dB**

Even if these carriers were to remain as active in-band links, which seems doubtful as explained above, they are predicted to be far too weak to become a direct interference source to the Gateway.

6 New Case Mitigation – 18 GHz

It is feasible that new in-band or adjacent band carrier(s) may be activated before or after O3b establishes service.

In the event newly activated carriers become an issue there are several interference mitigation steps which can be undertaken without resorting to interfering signal blockage techniques:

1. Bandpass filtering can be added to the LNA assemblies

   To preserve the system noise figure the LNAs are not aggressively filtered. There is margin on the downlinks to support the addition of filters without commercially impacting the throughput for the Gateway.

2. Operational elevation limits can be adjusted

O3b Networks USA, LLC
8900 Liberty Circle
Englewood, CO 80112

In the event terrestrial interference or out-of-band carriers are only problematic at lower elevations, O3b can modify the timing of handovers such they occur at higher Gateway elevation angles.

3. O3b will work with the link licensee to explore alternate link configurations

   A feasible technical solution might involve O3b offering to provide the licensee with a larger receive antenna. This affords a few technical advantages to the licensee and the RF radiation towards the O3b site could be reduced to non-degrading levels.

7 New Case Mitigation – 28 GHz

While 28 GHz band activity is extremely low at this time, it's feasible LMDS or other services could become an issue at a later date.

In the event this happens there are several interference mitigation steps which can be undertaken without resorting to interfering signal blockage techniques:

1. Channel re-assignment

   Link parameters including the RF channel and polarization may be changed to avoid interference with future occupants.

2. Operational elevation limits can be adjusted

   In the event terrestrial interference or out-of-band carriers are only problematic at lower elevations, O3b can modify the timing of handovers such they occur at higher Gateway elevation angles.

3. Modulator blanking may be used

   O3b Gateways use a sophisticated Monitoring and Control system which is capable of inhibiting modem modulators in selected portions of the tracking arc. If the interference case is one that can benefit from such "blanking", O3b would enable this feature during the interference portion of the contact.

   Internet traffic is comprised of blocks of data packets which rarely require continuous flow therefore the commercial impact to such blanking events is likely to be negligible. For particularly sensitive cases O3b is able to provide impacted customers with a content buffering system which further minimizes the impact of interruptions of this type.

4. O3b will work with the link licensee to explore alternate link configurations

   O3b will work with link licensee to identify alternate link configurations. A feasible option may include the affected link owner using larger antennas which would improve angular discrimination due to narrower beamwidths.

In most cases numerous technical and commercial opportunities are available to either eliminate or reduce the impact from interference issues.

EXHIBIT 1

SATELLITE EARTH STATION
FREQUENCY COORDINATION DATA
03/25/2010

Company	O3b Networks USA, LLC.
Owner Code	O3BNET
Earth Station Name, State	HALEIWA, HI (Sunset Beach)
Latitude (DMS) (NAD83)	21 40 15.8 N
Longitude (DMS) (NAD83)	158 1 56.1 W
Ground Elevation AMSL (Ft/m)	452.00 / 137.77
Antenna Centerline AGL (Ft/m)	12.01 / 3.66

Receive Antenna Type:	FCC32	FCC REFERENCE
18.0 GHz Gain (dBi) / Diameter (m)		61.2 / 7.3
3 dB / 15 dB Half Beamwidth		0.04 / 0.07
Transmit Antenna Type:	FCC32	FCC REFERENCE
29.0 GHz Gain (dBi) / Diameter (m)		65.0 / 7.3
3 dB / 15 dB Half Beamwidth		0.03 / 0.04

Operating Mode	TRANSMIT AND RECEIVE
Modulation	DIGITAL
Emission / Receive Band (MHz)	24K0G7D - 720MG7D / 17852.0000 - 18068.0000
	24K0G7D - 720MG7D / 18112.0000 - 18328.0000
	24K0G7D - 720MG7D / 18372.0000 - 18588.0000
	24K0G7D - 720MG7D / 18801.0000 - 19017.0000
	24K0G7D - 720MG7D / 19055.0000 - 19271.0000
	24K0G7D - 720MG7D / 19296.6000 - 19299.6000
Emission / Transmit Band (MHz)	24K0G7D - 720MG7D / 27652.0000 - 27868.0000
	24K0G7D - 720MG7D / 27912.0000 - 28128.0000
	24K0G7D - 720MG7D / 28172.0000 - 28388.0000
	24K0G7D - 720MG7D / 28601.0000 - 28817.0000
	24K0G7D - 720MG7D / 28855.0000 - 29071.0000
	24K0G7D - 720MG7D / 29088.5

Max. Available RF Power	(dBW)/4 kHz)	-14.00
	(dBW)/MHz)	10.00
Max. EIRP	(dBW)/4 kHz)	51.00
	(dBW)/MHz)	75.00

Max. Permissible Interference Power	
18.0 GHz, 20% (dBW/1 MHz)	-156.0
18.0 GHz, 0.0100% (dBW/1 MHz)	-146.0
29.0 GHz, 20% (dBW/4 kHz)	-151.0
29.0 GHz, 0.0025% (dBW/4 kHz)	-128.0
Low Earth Orbit Satellite	
Azimuth Range (Min/Max) Degrees	0.0 / 360.0
Minimum Elevation Angle Degrees	3.0
Radio Climate	B
Rain Zone	4
Max. Great Circle Coordination Distance (Mi/Km)	
18.0 GHz	241.1 / 388.0
29.0 GHz	164.8 / 265.2
Precipitation Scatter Contour Radius (Mi/Km)	
18.0 GHz	62.1 / 100.0
29.0 GHz	62.1 / 100.0

DESCRIPTION OF GREAT CIRCLE INTERFERENCE CASE HEADINGS

TERRESTRIAL PATH:	SITE NAME AND STATE; THE FIRST SITE LISTED IS THE TERRESTRIAL STATION INVOLVED IN THE INTERFERENCE CONFLICT
LAT:	LATITUDE OF THE INVOLVED TERRESTRIAL STATION
LON:	LONGITUDE OF THE INVOLVED TERRESTRIAL STATION
CALL:	FCC CALL SIGN OF THE INVOLVED TERRESTRIAL STATION
OWNER:	OWNER OF THE TERRESTRIAL PATH
GND:	GROUND ELEVATION (AMSL) OF THE INVOLVED TERRESTRIAL STATION
ACL:	ANTENNA CENTERLINE (AGL) OF THE INVOLVED TERRESTRIAL STATION
EDISCT:	EARTH STATION DISCRIMINATION ANGLE , IN DEGREES, TOWARDS THE INVOLVED TERRESTRIAL STATION
TDISCT:	INVOLVED TERRESTRIAL STATION DISCRIMINATION ANGLE, IN DEGREES, TOWARDS THE EARTH STATION
GES:	GAIN OF THE EARTH STATION IN dBi AT THE CALCULATED EDISCT
GTS:	GAIN OF THE INVOLVED TERRESTRIAL STATION IN DBI AT THE CALCULATED TDISCT
FSLOSS:	FREE SPACE PROPAGATION LOSS IN dB DUE TO THE DISTANCE BETWEEN THE EARTH STATION AND THE INVOLVED TERRESTRIAL STATION AT THE INTERFERENCE FREQUENCY
TANT:	INVOLVED TERRESTRIAL STATION ANTENNA CODE AND TYPE
DIST:	DISTANCE BETWEEN THE EARTH STATION AND THE INVOLVED TERRESTRIAL STATION IN KILOMETERS
AZ:	AZIMUTH IN DEGREES FROM TRUE NORTH FROM THE EARTH STATION TO THE INVOLVED TERRESTRIAL STATION
PR:	CALCULATED POWER RECEIVED IN dBW.

PR = GES + GTS + (TPWR – 30) – FSLOSS – LL for RECEIVE
PR = GES + GTS + TX POWER – FSLOSS – LL – TX_LOSS for TRANSMIT

TX POWER:	POWER OF EARTH STATION IN dBW/4kHz
MARGIN:	MARGIN IN DB TO THE INTERFERENCE OBJECTIVE. THIS VALUE IS THE DIFFERENCE BETWEEN THE OBJECTIVE AND THE PR
TPWR:	TRANSMIT POWER IN dBM OF THE TRANSMIT STATION IN THE INTERFERENCE CONFLICT
LL:	LINE LOSS OF THE INVOLVED TERRESTRIAL STATION
TX_LOSS:	TRANSMIT LINE LOSS
LOADING:	TRAFFIC LOADING OF THE INVOLVED TERRESTRIAL STATION
FREQ POL:	FREQUENCIES AND POLARIZATIONS OF THE INVOLVED TERRESTRIAL STATION

```
                    Great Circle Interference Conflicts
                                03/25/2010

Earth Station Name      HALEIWA, HI
Owner                   O3b Networks USA, LLC.
Latitude  (DMS) (NAD83)  21 40 15.8 N
Longitude (DMS) (NAD83) 158  1 56.1 W
Ground Elevation (Ft/m)      452.00 /   137.77 AMSL
Antenna Centerline (Ft/m)     12.01 /     3.66 AGL
Antenna Model               FCC REFERENCE 32-25LOG(THETA)
Objectives: Receive      -156.0 (dBW /1 MHz)
            Transmit     -151.0 (dBW /4 kHz)  Tx Power   -14.0 (dBW/4 kHz)

       Terrestrial Path              Gnd    Edisct  Ges FsLoss Dist  Pr Tpwr Plan
    Latitude   Longitude Call Sign   Acl    Tdisct  Gts Tant     Az  Margin LL
    Owner                                                Loading
    Freq/Pol

   1 HI03316A HANHIHI03302A KALHI   147.00 105.7   1.9 162.3  165.9-127.6 24.0H%
     21 55 51 159 36 45 WQJC836      18.29   0.3  38.9 81301E 280.3 28.4   0.0
    OMNPTC: T-Mobile License LLC                      192 CH    DIG  RCN: 08042404
  19455.0000V
    Status:  L                       Equipment: TEMJ05 Emission: 9M80G7W
     OH LOSS  20% / 0.0010%:   65.30 /  -2.80


   2 HI01041A    HIHI01048F    HI   345.00  89.7  -7.8 152.5   53.4-153.2 24.0H@
     21 19 12 157 40 45 WQEW560      15.20 352.5  13.1 81301E 136.7  2.8   0.0
    TMOBBT: T-MOBILE LIC LLC - VOICESTREAM PCS BTA I 96  CH    DIG  RCN: 05120123
  19515.0000V
    Status:  L                       Equipment: TEMA48 Emission: 4M90G7W
     OH LOSS  20% / 0.0010%:   86.20 /  71.80


   3 AIRPORT     HIPEARLRIDGE  HI     4.00  99.9 -10.0 149.7   39.1-153.6 20.01A
     21 20  5 157 55  3 WQJY737      17.37   3.6  18.7 87013A 162.3  2.4    2.6
    CORPCS: Coral Wireless Licenses, LLC              2016CH    DIG  RCN: 08092639
  18065.0000V  18115.0000H
    Status:  K                       Equipment: TEMR19 Emission: 50M0D7W
     OH LOSS  20% / 0.0010%:   78.20 /  28.80


   4 AIRPORT     HIPEARLRIDGE  HI     4.00  99.9 -10.0 149.7   39.1-153.6 20.01A
     21 20  5 157 55  3 WQJY737      41.15   3.6  18.7 87013A 162.3  2.4    2.6
    CORPCS: Coral Wireless Licenses, LLC              2016CH    DIG  RCN: 09021314
  18065.0000V  18115.0000H
    Status:  K                       Equipment: TEMR19 Emission: 50M0D7W
     OH LOSS  20% / 0.0010%:   80.10 /  45.30


                  ****  END OF GREAT CIRCLE CASES REPORT  ****
```

Pathloss Calculation (NSMA Tropo)

Path data for case # 1	HALEIWA		HI03316A HAN	
Latitude	21 40 15.8		21 55 51.0	
Longitude	158 1 56.1		159 36 45.5	
Antenna Center Agl	12.01 ft.	3.66 m.	60.01 ft.	18.29 m.
Site Elevation Amsl	452.02 ft.	137.77 m.	482.31 ft.	147.00 m.
Antenna Center Amsl	464.03 ft.	141.43 m.	542.32 ft.	165.29 m.
Effective Antenna Ht ...	464.03 ft.	141.43 m.	205.23 ft.	62.55 m.
Horizon Distance	30.44 mi.	48.98 km.	5.59 mi.	9.00 km.
Horizon Elevation Amsl .	0.00 ft.	0.00 m.	882.98 ft.	269.12 m.
Ray Crossover Angle	24.82 mr.			
Terrain Delta Ht	127.90 ft.	38.98 m.		
Effective Distance	126.24 mi.	203.12 km.		
Pathlength	103.13 mi.	165.94 km.		
Azimuth	280.28 deg.		99.69 deg.	
Frequency	18700 MHz			
K Factor	1.33 (K)			

Radio Climate Phrase ... Maritime Temperate Climate Over Land
Type of Path .... Irregular Terrain
Free Space Path Loss ... 162.2 dB Atmospheric Loss ... 12.050 dB
Diff. Loss .... 314.1 dB (476.3 dB) Tropo. Loss ... 70.4 dB (232.7 dB)
Terrain data type ...... 1.0 ARC Second

Losses	L-Fspl	Sigma	Controlling	Propagation Mode
227.5 dB	65.3 dB	4.6 dB	20. %	Tropospheric Scatter
193.8 dB	31.5 dB	11.4 dB	1. %	Tropospheric Scatter
172.4 dB	10.1 dB	16.0 dB	0.1 %	Tropospheric Scatter
159.4 dB	-2.8 dB	20.1 dB	0.01 %	Tropospheric Scatter
157.6 dB	-4.7 dB	23.3 dB	0.0025%	Tropospheric Scatter

The OH loss calculations considered a terrain profile of 499 points.
The list below shows the highest point in each fiftieth of the path length.

Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)	Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)
0.00	137.8	3.7	0.0	0.0	82.97	0.0	0.0	153.4	-252.6
0.33	130.2	0.0	11.2	8.0	86.30	0.0	0.0	153.8	-251.4
3.33	0.0	0.0	141.9	110.0	89.63	0.0	0.0	154.3	-249.0
6.66	0.0	0.0	142.4	79.8	92.96	0.0	0.0	154.8	-245.2
10.00	0.0	0.0	142.9	50.9	96.30	0.0	0.0	155.3	-240.2
13.33	0.0	0.0	143.3	23.4	99.63	0.0	0.0	155.8	-233.8
16.66	0.0	0.0	143.8	-2.8	102.96	0.0	0.0	156.2	-226.1
19.99	0.0	0.0	144.3	-27.8	106.29	0.0	0.0	156.7	-217.1
23.32	0.0	0.0	144.8	-51.4	109.62	0.0	0.0	157.2	-206.8
26.66	0.0	0.0	145.3	-73.7	112.96	0.0	0.0	157.7	-195.2
29.99	0.0	0.0	145.7	-94.7	116.29	0.0	0.0	158.2	-182.3
33.32	0.0	0.0	146.2	-114.4	119.62	0.0	0.0	158.6	-168.1
36.65	0.0	0.0	146.7	-132.7	122.95	0.0	0.0	159.1	-152.5
39.98	0.0	0.0	147.2	-149.8	126.28	0.0	0.0	159.6	-135.7
43.32	0.0	0.0	147.7	-165.6	129.62	0.0	0.0	160.1	-117.5
46.65	0.0	0.0	148.1	-180.0	132.95	0.0	0.0	160.5	-98.1
48.98	0.0	0.0	148.5	-189.3	136.28	0.0	0.0	161.0	-77.3
49.98	0.0	0.0	148.6	-193.1	139.61	0.0	0.0	161.5	-55.2
53.31	0.0	0.0	149.1	-205.0	144.94	39.3	0.0	122.9	-56.5
56.64	0.0	0.0	149.6	-215.5	149.28	66.2	0.0	96.7	-50.0
59.98	0.0	0.0	150.1	-224.7	151.94	115.4	0.0	47.9	-77.5
63.31	0.0	0.0	150.5	-232.6	154.27	171.9	0.0	-8.3	-114.4
66.64	0.0	0.0	151.0	-239.2	156.94	269.1	0.0	-105.1	-188.4
69.97	0.0	0.0	151.5	-244.5	159.60	146.5	0.0	17.9	-41.7
73.30	0.0	0.0	152.0	-248.5	165.60	123.7	0.0	41.5	38.3
76.64	0.0	0.0	152.4	-251.1	165.94	147.0	18.3	0.0	0.0
79.97	0.0	0.0	152.9	-252.5					

Pathloss Calculation (NSMA Tropo)

Path data for case # 2	HALEIWA		HI01041A	
Latitude	21 40 15.8		21 19 12.2	
Longitude	158 1 56.1		157 40 45.0	
Antenna Center Agl	12.01 ft.	3.66 m.	49.87 ft.	15.20 m.
Site Elevation Amsl	452.02 ft.	137.77 m.	1131.94 ft.	345.00 m.
Antenna Center Amsl	464.03 ft.	141.43 m.	1181.82 ft.	360.20 m.
Effective Antenna Ht ...	12.01 ft.	3.66 m.	1026.47 ft.	312.85 m.
Horizon Distance	2.84 mi.	4.57 km.	23.06 mi.	37.11 km.
Horizon Elevation Amsl .	1354.00 ft.	412.68 m.	2734.75 ft.	833.51 m.
Ray Crossover Angle	75.99 mr.			
Terrain Delta Ht	1087.88 ft.	331.57 m.		
Effective Distance	46.88 mi.	75.43 km.		
Pathlength	33.17 mi.	53.38 km.		
Azimuth	136.66 deg.		316.79 deg.	
Frequency	18700 MHz			
K Factor	1.33 (K)			

Radio Climate Phrase ... Maritime Temperate Climate Over Land
Type of Path .... Irregular Terrain
Free Space Path Loss ... 152.4 dB Atmospheric Loss ... 3.876 dB
Diff. Loss .... 398.5 dB (550.9 dB) Tropo. Loss ... 89.9 dB (242.3 dB)
Terrain data type ...... 1.0 ARC Second

Losses	L-Fspl	Sigma	Controlling	Propagation Mode
238.6 dB	86.2 dB	3.6 dB	20. %	Tropospheric Scatter
237.5 dB	85.1 dB	3.7 dB	1. %	Tropospheric Scatter
231.2 dB	78.8 dB	4.4 dB	0.1 %	Tropospheric Scatter
224.2 dB	71.8 dB	5.7 dB	0.01 %	Tropospheric Scatter
216.6 dB	64.2 dB	7.1 dB	0.0025%	Tropospheric Scatter

The OH loss calculations considered a terrain profile of 375 points.
The list below shows the highest point in each fiftieth of the path length.

Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)	Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)
0.00	137.8	3.7	0.0	0.0	26.69	12.2	0.0	238.6	196.6
0.71	156.1	0.0	-11.8	-14.0	28.54	1.0	0.0	257.4	215.6
1.57	179.9	0.0	-32.0	-36.8	28.83	0.0	0.0	259.6	217.9
3.00	272.4	0.0	-118.7	-127.6	29.97	0.0	0.0	264.3	222.9
4.14	357.5	0.0	-199.1	-211.1	30.97	0.0	0.0	268.4	227.4
4.57	412.7	0.3	-252.9	-266.0	32.11	0.0	0.0	273.0	232.8
5.28	426.2	0.0	-263.1	-278.1	33.11	0.0	0.0	277.1	237.6
6.28	496.0	0.0	-328.8	-346.3	34.25	0.0	0.0	281.8	243.2
6.42	488.7	0.0	-321.0	-338.7	35.25	0.0	0.0	285.9	248.2
8.42	544.0	0.0	-368.0	-390.3	36.39	0.0	0.0	290.6	254.1
9.42	601.1	0.0	-421.1	-445.5	37.39	0.0	0.0	294.7	259.4
10.56	648.9	0.0	-464.2	-490.9	39.39	3.1	0.0	299.8	267.3
11.27	677.8	0.0	-490.2	-518.2	40.10	80.0	0.0	225.8	194.4
12.70	688.4	0.0	-494.9	-525.4	40.67	1.0	0.0	307.1	276.7
13.56	756.8	0.0	-559.8	-591.6	41.67	1.0	0.0	311.2	282.5
13.99	742.5	0.0	-543.7	-576.2	43.10	41.6	0.0	276.4	250.3
15.98	820.8	0.0	-613.9	-649.1	44.67	6.0	0.0	318.5	295.6
16.27	833.5	0.0	-625.4	-661.0	45.81	92.5	0.0	236.7	216.2
17.13	806.8	0.0	-595.2	-631.8	45.95	105.0	0.0	224.8	204.7
18.27	382.1	0.0	-165.8	-203.6	47.24	11.6	0.0	323.5	306.4
20.27	255.0	0.0	-30.5	-70.0	48.67	6.0	0.0	334.9	321.4
20.41	231.0	0.0	-5.9	-45.6	49.38	6.0	0.0	337.8	326.2
22.26	278.2	0.0	-45.6	-86.4	50.38	2.7	0.0	345.2	336.3
23.26	279.2	0.0	-42.4	-83.7	52.23	1.2	0.0	354.4	350.8
23.83	521.8	0.0	-282.7	-324.2	53.23	294.3	0.0	65.3	64.8
25.40	285.3	0.0	-39.8	-81.7	53.38	345.0	15.2	0.0	0.0
26.12	248.8	0.0	-0.3	-42.3					

Pathloss Calculation (NSMA Tropo)

Path data for case # 3	HALEIWA		AIRPORT		
Latitude	21 40 15.8		21 20 5.0		
Longitude	158 1 56.1		157 55 3.4		
Antenna Center Agl	12.01 ft.	3.66 m.	56.99 ft.	17.37 m.	
Site Elevation Amsl	452.02 ft.	137.77 m.	13.12 ft.	4.00 m.	
Antenna Center Amsl	464.03 ft.	141.43 m.	70.11 ft.	21.37 m.	
Effective Antenna Ht ...	12.01 ft.	3.66 m.	56.99 ft.	17.37 m.	
Horizon Distance	2.31 mi.	3.71 km.	9.31 mi.	14.98 km.	
Horizon Elevation Amsl .	934.00 ft.	284.67 m.	1115.41 ft.	339.96 m.	
Ray Crossover Angle	63.40 mr.				
Terrain Delta Ht	479.93 ft.	146.28 m.			
Effective Distance	82.50 mi.	132.75 km.			
Pathlength	24.29 mi.	39.09 km.			
Azimuth	162.29 deg.		342.33 deg.		
Frequency	18700 MHz				
K Factor	1.33 (K)				

Radio Climate Phrase ... Maritime Temperate Climate Over Land
Type of Path .... Irregular Terrain
Free Space Path Loss ... 149.7 dB Atmospheric Loss ... 2.838 dB
Diff. Loss .... 444.2 dB (593.9 dB) Tropo. Loss ... 88.4 dB (238.1 dB)
Terrain data type ...... 1.0 ARC Second

Losses	L-Fspl	Sigma	Controlling	Propagation Mode
227.9 dB	78.2 dB	4.1 dB	20. %	Tropospheric Scatter
208.2 dB	58.5 dB	7.7 dB	1. %	Tropospheric Scatter
195.1 dB	45.5 dB	10.4 dB	0.1 %	Tropospheric Scatter
178.5 dB	28.8 dB	14.0 dB	0.01 %	Tropospheric Scatter
160.4 dB	10.7 dB	17.9 dB	0.0025%	Tropospheric Scatter

The OH loss calculations considered a terrain profile of 275 points.
The list below shows the highest point in each fiftieth of the path length.

Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)	Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)
0.00	137.8	3.7	0.0	0.0	20.26	381.7	0.0	-302.5	-324.9
0.57	157.0	0.0	-17.3	-18.6	20.54	388.5	0.0	-310.1	-332.6
0.86	134.6	0.0	4.2	2.3	21.83	332.8	0.0	-258.4	-280.6
2.14	181.1	0.0	-46.2	-50.9	21.97	331.8	0.0	-257.8	-280.0
3.00	213.8	0.0	-81.6	-88.0	23.11	306.2	0.0	-235.7	-257.5
3.71	284.7	0.0	-154.6	-162.4	24.11	340.0	0.0	-272.6	-293.9
4.56	252.0	0.0	-124.6	-133.9	24.25	333.6	0.0	-266.6	-287.8
4.99	224.1	0.0	-98.0	-108.0	25.39	311.6	0.0	-248.1	-268.6
6.13	262.6	0.0	-140.0	-152.0	25.82	285.1	0.0	-223.0	-243.2
6.99	311.0	0.0	-191.1	-204.3	26.68	199.9	0.0	-140.4	-160.0
7.28	355.5	0.0	-236.4	-250.1	27.96	226.3	0.0	-170.8	-189.1
8.13	375.0	0.0	-258.5	-273.4	28.25	221.3	0.0	-166.6	-184.7
8.84	400.7	0.0	-286.4	-302.2	29.24	186.6	0.0	-135.0	-152.0
9.56	392.9	0.0	-280.8	-297.4	30.24	151.9	0.0	-103.4	-119.2
10.27	366.6	0.0	-256.8	-274.2	30.67	141.0	0.0	-93.8	-109.0
11.41	374.7	0.0	-268.3	-286.9	31.38	101.8	0.0	-56.8	-71.1
11.98	432.0	0.0	-327.3	-346.5	32.24	70.8	0.0	-28.4	-41.4
13.27	463.3	0.0	-362.6	-382.8	32.95	41.5	0.0	-1.3	-13.2
13.41	471.7	0.0	-371.5	-391.8	33.67	23.7	0.0	14.3	3.6
14.27	410.8	0.0	-313.2	-334.0	34.52	13.4	0.0	21.9	12.6
14.98	396.1	0.0	-300.7	-322.0	35.95	16.6	0.0	14.4	7.7
15.69	441.3	0.0	-348.1	-369.7	36.38	29.9	0.0	-0.2	-6.1
16.55	440.0	0.0	-349.4	-371.4	37.09	52.0	0.0	-24.5	-28.9
17.69	432.9	0.0	-345.8	-368.1	37.66	28.7	0.0	-3.0	-6.1
18.69	379.7	0.0	-295.7	-318.2	38.37	12.0	0.0	11.6	9.9
19.26	424.1	0.0	-341.8	-364.4	39.09	4.0	17.4	0.0	0.0

Pathloss Calculation (NSMA Tropo)

Path data for case # 4	HALEIWA			AIRPORT		
Latitude	21 40 15.8			21 20 5.0		
Longitude	158 1 56.1			157 55 3.4		
Antenna Center Agl	12.01 ft.	3.66 m.		135.01 ft.	41.15 m.	
Site Elevation Amsl	452.02 ft.	137.77 m.		13.12 ft.	4.00 m.	
Antenna Center Amsl	464.03 ft.	141.43 m.		148.14 ft.	45.15 m.	
Effective Antenna Ht ...	12.01 ft.	3.66 m.		135.01 ft.	41.15 m.	
Horizon Distance	2.31 mi.	3.71 km.		9.31 mi.	14.98 km.	
Horizon Elevation Amsl .	934.00 ft.	284.67 m.		1115.41 ft.	339.96 m.	
Ray Crossover Angle	61.81 mr.					
Terrain Delta Ht	479.93 ft.	146.28 m.				
Effective Distance	69.28 mi.	111.46 km.				
Pathlength	24.29 mi.	39.09 km.				
Azimuth	162.29 deg.			342.33 deg.		
Frequency	18700 MHz					
K Factor	1.33 (K)					

Radio Climate Phrase ... Maritime Temperate Climate Over Land
Type of Path .... Irregular Terrain
Free Space Path Loss ... 149.7 dB Atmospheric Loss ... 2.838 dB
Diff. Loss .... 434.0 dB (583.6 dB) Tropo. Loss ... 88.0 dB (237.7 dB)
Terrain data type ...... 1.0 ARC Second

Losses	L-Fspl	Sigma	Controlling	Propagation Mode
229.8 dB	80.1 dB	3.9 dB	20. %	Tropospheric Scatter
216.5 dB	66.8 dB	6.0 dB	1. %	Tropospheric Scatter
207.8 dB	58.1 dB	7.7 dB	0.1 %	Tropospheric Scatter
195.0 dB	45.3 dB	10.4 dB	0.01 %	Tropospheric Scatter
180.4 dB	30.7 dB	13.5 dB	0.0025%	Tropospheric Scatter

The OH loss calculations considered a terrain profile of 275 points.
The list below shows the highest point in each fiftieth of the path length.

Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)	Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)
0.00	137.8	3.7	0.0	0.0	20.26	381.7	0.0	-290.1	-312.6
0.57	157.0	0.0	-17.0	-18.3	20.54	388.5	0.0	-297.6	-320.1
0.86	134.6	0.0	4.7	2.8	21.83	332.8	0.0	-245.1	-267.4
2.14	181.1	0.0	-44.9	-49.6	21.97	331.8	0.0	-244.5	-266.6
3.00	213.8	0.0	-79.8	-86.2	23.11	306.2	0.0	-221.7	-243.5
3.71	284.7	0.0	-152.4	-160.1	24.11	340.0	0.0	-257.9	-279.2
4.56	252.0	0.0	-121.8	-131.1	24.25	333.6	0.0	-251.9	-273.1
4.99	224.1	0.0	-94.9	-105.0	25.39	311.6	0.0	-232.7	-253.2
6.13	262.6	0.0	-136.3	-148.2	25.82	285.1	0.0	-207.3	-227.5
6.99	311.0	0.0	-186.8	-200.0	26.68	199.9	0.0	-124.2	-143.7
7.28	355.5	0.0	-232.0	-245.7	27.96	226.3	0.0	-153.7	-172.1
8.13	375.0	0.0	-253.6	-268.4	28.25	221.3	0.0	-149.4	-167.5
8.84	400.7	0.0	-281.1	-296.8	29.24	186.6	0.0	-117.2	-134.2
9.56	392.9	0.0	-275.0	-291.6	30.24	151.9	0.0	-85.0	-100.8
10.27	366.6	0.0	-250.5	-268.0	30.67	141.0	0.0	-75.1	-90.4
11.41	374.7	0.0	-261.4	-280.0	31.38	101.8	0.0	-37.7	-52.0
11.98	432.0	0.0	-320.0	-339.2	32.24	70.8	0.0	-8.8	-21.8
13.27	463.3	0.0	-354.5	-374.7	32.95	41.5	0.0	18.7	6.8
13.41	471.7	0.0	-363.3	-383.6	33.67	23.7	0.0	34.8	24.0
14.27	410.8	0.0	-304.5	-325.4	34.52	13.4	0.0	42.9	33.7
14.98	396.1	0.0	-291.6	-312.9	35.95	16.6	0.0	36.2	29.6
15.69	441.3	0.0	-338.5	-360.2	36.38	29.9	0.0	21.9	16.1
16.55	440.0	0.0	-339.4	-361.3	37.09	52.0	0.0	-1.9	-6.3
17.69	432.9	0.0	-335.0	-357.3	37.66	28.7	0.0	19.9	16.8
18.69	379.7	0.0	-284.3	-306.8	38.37	12.0	0.0	34.9	33.3
19.26	424.1	0.0	-330.1	-352.6	39.09	4.0	41.2	0.0	0.0

EXHIBIT 2

O3b Networks Ka-Band Earth Station

Frequency Coordination Report

28 GHz

Prepared on Behalf of
O3b Networks USA, LLC

May 4, 2010

COMSEARCH®
A CommScope Company

Table of Contents

1.	**Summary of Results**	**- 1 -**
2.	**Supplemental Showing No. 1**	**- 2 -**
3.	**Supplemental Showing No. 2**	**- 3 -**
4.	**Earth Station Coordination Data**	**- 4 -**
5.	**Contact Information**	**- 8 -**

1. Summary of Results

In support of O3b Network's proposed earth stations transmitting at 28 GHz[1], Comsearch performed a frequency search considering all existing and proposed incumbent licenses within the coordination contours of the proposed Ka-Band station. The search results identified licensees in the common carrier fixed point-to-point microwave service, local television transmission service and local multipoint distribution service (LMDS). Prior notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report.

Our notification to the LMDS incumbents was performed under the assumption that O3b Networks would be operating on a secondary basis to LMDS Block A operations. To date, we have received no objections to the deployment of the earth stations and a contact at O3b Networks has been provided to the incumbents in case any concerns may arise in the future.

[1] O3b Network's earth stations will operate in the 27.6 – 28.4 GHz and 28.6 – 29.1 GHz portion of the 28 GHz band.

2. Supplemental Showing No. 1

Pursuant to Part 25.203(c) of the FCC Rules and Regulations, a proposed Ka-Band earth station in Haleiwa, HI was prior coordinated by Comsearch. The notification letters and datasheet for this earth station were sent to the following 28 GHz common carrier fixed microwave licensees on April 2, 2010. These licensees are authorized to operate temporary fixed operations from 27.5 – 29.5 GHz in the state of Hawaii or on a nationwide basis.

- GTE Southwest Inc. dba Verizon Southwest
- Hawaiian Telcom
- Metronet Communications
- Princeton Scientific Capital Management Corp.
- Verizon West Virginia Inc.

A notification letter and datasheet for the Haleiwa, HI earth station was also sent to the following 28 GHz local television transmission licensee on April 2, 2010. This licensee is authorized to operate temporary fixed operations from 27.5 – 29.5 GHz on a nationwide basis.

- Information Super Station, LLC

3. Supplemental Showing No. 2

Notification letters and datasheets were sent to the following 28 GHz LMDS licensees on April 2, 2010. The proposed earth station will operate from 27.6 – 28.4 GHz and 28.6 – 29.1 GHz which overlaps Block A of the LMDS Service. The band plan for LMDS is as follows:

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
BTA Associates LLC	BTA192	Honolulu, HI
BTA Associates LLC	BTA190	Hilo, HI
BTA Associates LLC	BTA222	Kahului-Wailuku-Lahaina, HI
Lakedale Link, Inc.	BTA254	Lihue, HI

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station in Haleiwa, HI. This data was circulated to all incumbent licensees in the 28 GHz shared frequency ranges.

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 http://www.comsearch.com

Date: 03/25/2010

Administrative Information			
Status	ENGINEER PROPOSAL		
Licensee Code	O3BNET		
Licensee Name	O3b Networks USA, LLC.		
Site Information	**HALEIWA, HI (Sunset Beach)**		
Street Address	58-350 Kamehameha Hwy		
Latitude (NAD 83)	21° 40' 15.8" N		
Longitude (NAD 83)	158° 1' 56.1" W		
Climate Zone	B		
Rain Zone	4		
Ground Elevation (AMSL)	137.77 m / 452.0 ft		
Link Information			
Satellite Type	Low Earth Orbit		
Mode	TR - Transmit-Receive		
Modulation	Digital		
Minimum Elevation Angle	3.0°		
Azimuth Range	0.0° to 360°		
Antenna Centerline (AGL)	3.66 m / 12.0 ft		

Antenna Information		**Receive - FCC32**	**Transmit - FCC32**
Manufacturer		Viasat	Viasat
Model		8073	8073
Gain / Diameter		61.2 dBi / 7.3 m	65.0 dBi / 7.3 m
3-dB / 15-dB Beamwidth		0.07° / 0.14°	0.05° / 0.09°
Max Available RF Power	(dBW/4 kHz)		15.7
	(dBW/MHz)		39.7
Maximum EIRP	(dBW/4 kHz)		80.7
	(dBW/MHz)		104.7
Interference Objectives:	Long Term	-160.0 dBW/MHz 20%	-151.0 dBW/4 kHz 20%
	Short Term	-150.0 dBW/MHz 0.01%	-128.0 dBW/4 kHz 0.0025%

Frequency Information	**Receive 18.0 GHz**	**Transmit 29.0 GHz**
Emission / Frequency Range (MHz)	24K0G7D - 720MG7D / 17852.0 - 18068.0	24K0G7D - 720MG7D / 27652.0 - 27868.0
	24K0G7D - 720MG7D / 18112.0 - 18328.0	24K0G7D - 720MG7D / 27912.0 - 28128.0
	24K0G7D - 720MG7D / 18372.0 - 18588.0	24K0G7D - 720MG7D / 28172.0 - 28388.0
	24K0G7D - 720MG7D / 18801.0 - 19017.0	24K0G7D - 720MG7D / 28601.0 - 28817.0
	24K0G7D - 720MG7D / 19055.0 - 19271.0	24K0G7D - 720MG7D / 28855.0 - 29071.0
	24K0G7D - 720MG7D / 19296.6 - 19299.6	24K0G7D - 720MG7D / 29088.5
Max Great Circle Coordination Distance	388.0 km / 241.1 mi	265.2 km / 164.8 mi
Precipitation Scatter Contour Radius	124.7 km / 77.5 mi	398.6 km / 247.6 mi

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 http://www.comsearch.com

Coordination Values	**HALEIWA, HI**			
Licensee Name	O3b Networks USA, LLC.			
Latitude (NAD 83)	21° 40' 15.8" N			
Longitude (NAD 83)	158° 1' 56.1" W			
Ground Elevation (AMSL)	137.77 m / 452.0 ft			
Antenna Centerline (AGL)	3.66 m / 12.0 ft			
Antenna Model	Viasat 8073			
Antenna Mode	Receive 18.0 GHz		Transmit 29.0 GHz	
Interference Objectives: Long Term	-160.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
Short Term	-150.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%
Max Available RF Power			15.7 (dBW/4 kHz)	

			Receive 18.0 GHz		Transmit 29.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	72.41	-10.00	100.00	-10.00	100.00
5	0.00	70.74	-10.00	100.00	-10.00	100.00
10	0.00	69.21	-10.00	100.00	-10.00	100.00
15	0.00	67.83	-10.00	100.00	-10.00	100.00
20	0.00	66.61	-10.00	100.00	-10.00	100.00
25	0.00	65.58	-10.00	100.00	-10.00	100.00
30	0.00	64.73	-10.00	100.00	-10.00	100.00
35	0.00	64.09	-10.00	100.00	-10.00	100.00
40	0.30	63.96	-10.00	100.00	-10.00	100.00
45	0.00	63.44	-10.00	100.00	-10.00	100.00
50	1.11	64.54	-9.37	100.00	-9.37	100.00
55	1.10	64.74	-8.09	100.00	-8.09	100.00
60	0.76	64.82	-6.67	100.00	-6.67	100.00
65	0.98	65.64	-5.04	100.00	-5.04	100.00
70	1.36	66.80	-3.08	100.00	-3.08	100.00
75	1.63	68.01	-0.78	146.73	-0.78	100.00
80	1.56	69.09	2.20	152.01	2.20	100.00
85	1.59	70.40	6.16	174.97	6.16	117.33
90	1.94	72.08	11.38	248.40	11.38	162.51
95	2.51	73.99	16.25	388.02	16.25	265.20
100	2.74	75.74	11.75	250.92	11.75	163.92
105	3.09	77.62	6.24	216.55	6.24	144.91
110	2.90	79.29	2.36	196.39	2.36	133.53
115	3.68	81.42	-0.48	183.74	-0.48	128.04
120	3.59	83.24	-2.72	175.03	-2.72	121.23
125	3.60	85.14	-4.56	171.15	-4.56	115.29
130	3.38	87.04	-6.11	165.56	-6.11	110.05
135	3.23	89.00	-7.45	160.74	-7.45	105.35
140	3.02	90.99	-8.62	156.53	-8.62	100.00
145	2.83	93.00	-9.65	152.84	-9.65	100.00
150	2.00	95.16	-10.00	151.57	-10.00	100.00
155	2.37	97.07	-10.00	151.57	-10.00	100.00
160	2.43	99.00	-10.00	151.57	-10.00	100.00
165	2.37	100.91	-10.00	151.57	-10.00	100.00
170	2.75	102.53	-10.00	151.57	-10.00	100.00
175	2.51	104.37	-10.00	151.57	-10.00	100.00
180	2.24	106.16	-10.00	151.57	-10.00	100.00
185	2.45	107.54	-10.00	151.57	-10.00	100.00

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 http://www.comsearch.com

Coordination Values	**HALEIWA, HI**			
Licensee Name	O3b Networks USA, LLC.			
Latitude (NAD 83)	21° 40' 15.8" N			
Longitude (NAD 83)	158° 1' 56.1" W			
Ground Elevation (AMSL)	137.77 m / 452.0 ft			
Antenna Centerline (AGL)	3.66 m / 12.0 ft			
Antenna Model	Viasat 8073			
Antenna Mode	Receive 18.0 GHz		Transmit 29.0 GHz	
Interference Objectives: Long Term	-160.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
Short Term	-150.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%
Max Available RF Power			15.7 (dBW/4 kHz)	

			Receive 18.0 GHz		Transmit 29.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	2.53	108.86	-10.00	151.57	-10.00	100.00
195	2.25	110.33	-10.00	151.57	-10.00	100.00
200	2.23	111.46	-10.00	151.57	-10.00	100.00
205	1.97	112.63	-10.00	151.57	-10.00	100.00
210	1.77	113.60	-10.00	151.57	-10.00	100.00
215	0.91	115.03	-9.65	152.84	-9.65	100.00
220	0.87	115.48	-8.62	156.53	-8.62	100.00
225	0.81	115.75	-7.45	160.74	-7.45	105.35
230	0.48	116.09	-6.11	165.56	-6.11	110.05
235	0.75	115.61	-4.56	171.16	-4.56	115.30
240	0.29	115.63	-2.72	175.03	-2.72	121.23
245	0.00	115.28	-0.48	183.74	-0.48	128.03
250	0.00	114.43	2.36	196.38	2.36	133.53
255	0.00	113.40	6.24	216.52	6.24	144.90
260	0.00	112.19	11.65	250.21	11.65	163.52
265	0.00	110.81	15.81	384.26	15.81	262.84
270	0.84	108.69	11.11	246.67	11.11	161.54
275	0.00	107.61	5.84	214.29	5.84	143.65
280	0.00	105.83	2.01	194.73	2.01	135.08
285	0.00	103.93	-0.89	182.08	-0.89	126.83
290	0.00	101.94	-3.20	176.05	-3.20	119.72
295	0.00	99.88	-5.09	131.49	-5.09	100.00
300	0.00	97.75	-6.71	100.00	-6.71	100.00
305	0.00	95.57	-8.13	100.00	-8.13	100.00
310	0.00	93.36	-9.39	100.00	-9.39	100.00
315	0.00	91.13	-10.00	100.00	-10.00	100.00
320	0.00	88.90	-10.00	100.00	-10.00	100.00
325	0.00	86.66	-10.00	100.00	-10.00	100.00
330	0.00	84.45	-10.00	100.00	-10.00	100.00
335	0.00	82.28	-10.00	100.00	-10.00	100.00
340	0.00	80.15	-10.00	100.00	-10.00	100.00
345	0.00	78.08	-10.00	100.00	-10.00	100.00
350	0.00	76.10	-10.00	100.00	-10.00	100.00
355	0.00	74.20	-10.00	100.00	-10.00	100.00

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, 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 application and that it is complete and accurate to the best of my knowledge and belief.

_________/s/_________

Richard J. Barnett, PhD, BSc
Telecomm Strategies Inc.
6404 Highland Drive
Chevy Chase, MD 20815
(301) 656-8969

July 23, 2010

ATTACHMENT B

File Number: SSU 1999

Ofcom

10 September 2009

Mr G Wyler
O3B Networks Limited
St John's Manor Offices
Le Neuf Chemin
St John
Jersey
JE3 4EH
Channel Islands

Stephen Limb
International Frequency Co-ordination

Direct line: + 44 20 7981 3091
Direct fax: + 44 20 7981 3208
Mobile: + 44 7818 075 102

ifc.enquiries@ofcom.org.uk

Dear Sir

Introduction of O3B

Ofcom has made the following filings to the ITU Radiocommunication Bureau in respect of O3B Networks Limited:

O3B-A

Total line = 4/4

ID number	adm	ORG or Geo.area	Satellite name	Earth station	long_nom	Date of receipt	ssn_ref	ssn_no	ssn rev	ssn rev no	Part/ Art.	WIC/IFIC	WIC/IFIC date
up down	up down	up down	up down	up down	up down	up down	up down	up down				up down	
107540734	G		O3B-A		N-GSO	23.10.2007	API/A	4800				2608	27.11.2007
108520116	G		O3B-A		N-GSO	18.04.2008	CR/C	2209				2626	19.08.2008
108520116	G		O3B-A		N-GSO	23.04.2008	CR/C	2209	M	1		2632	11.11.2008
108520116	G		O3B-A		N-GSO	10.02.2009	CR/C	2209	M	2		2644	19.05.2009

O3B-B

ID number	adm	ORG or Geo.area	Satellite name	Earth station	long_nom	Date of receipt	ssn_ref	ssn_no	ssn rev	ssn rev no	Part/ Art.	WIC/IFIC	WIC/IFIC date
109540034	G		O3B-B		N-GSO	06.02.2009	API/A	5524				2640	24.03.2009

Yours faithfully

Stephen Limb BSc(Eng) MPhil CEng MIET