BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

In re the Matter of	)	
	)	
Hughes Network Systems, LLC	)	File No. ______________________
	)	
Letter of Intent to Access the U.S. Market	)	Call Sign _____
Using a Non-U.S. Licensed Ka-/V-Band	)	
Geostationary Fixed-Satellite Service	)	
Satellite at the 90.9º W.L. Orbital Location	)	

LETTER OF INTENT

Hughes Network Systems, LLC ("Hughes"), pursuant to Section 25.137 of the Commission's Rules (47 C.F.R. § 25.137), hereby submits this Letter of Intent seeking to use a Ka-/V-band geostationary orbit ("GSO), Fixed-Satellite Service ("FSS") satellite authorized under the laws of the United Kingdom[1] to provide non-common carrier services to the U.S. market from the orbital location at 90.9° West Longitude. The new Hughes satellite is named "Jupiter 91W."

I. GENERAL DESCRIPTION AND SERVICES TO BE PROVIDED

The Jupiter 91W satellite is intended to expand upon Hughes' recent initiatives to meet the growing need in the U.S. and beyond for advanced two-way communications

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[1] The subject UK-licensed satellite has been published through the International Telecommunication Union ("ITU") under the designation UKSAT-15 for the Ka-band portion, and UKSAT-25 for the V-band portion. Details of UKSAT-15 can be found in IFIC 2617 under CR/C/2120 as published by the ITU on April 15, 2008. Details of UKSAT-25 can be found in IFIC 2692 under API-A/6730 as published by the ITU on April 19, 2011. ITU publication evidences U.K. grant of authority to operate at this orbital location. *See, e.g., Pacific Century Group, Inc.,* 16 FCC Rcd 14356, 14361 n.37 (2001).

services, both business and residential. The demand and need for high-speed broadband service indicates that there is an ample market for the types of services that Hughes proposes to provide through this Letter of Intent. Without limitation, these services include high-speed data transmission and high-speed Internet access, which in turn can be used by third party content-providers for offerings such as high definition video programming, on-demand entertainment, digital music, and interactive television. The Ka-band payload will provide services primarily to CONUS, but potentially also parts of Canada and Mexico. The V-band payload will provide supplemental services to the drier, mid-western regions of CONUS that will not served by the Ka-band payload. Isolated rural areas that are currently not well served by available terrestrial technologies are particularly likely to benefit from the availability of the new capacity proposed here. Provision of high-speed Internet service to such areas is currently a high national priority, the fulfillment of which should provide substantial new job opportunities and promote economic recovery.[2]

The Jupiter 91W satellite will incorporate state-of-the-art engineering to achieve enhanced flexibility of service offerings. The satellite features capacity in excess of 100 Gbps, and will provide 60 spot beams operating through 15 gateway Earth stations at Ka-band, and 16 user beams and 16 gateway beans at V-band. The Jupiter 91W network will be compliant with Commission rules relating to blanket Earth station licensing.

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[2] *See, e.g., American Recovery and Reinvestment Act of 2009*, § 6001 (requiring the National Telecommunications and Information Administration to establish the Broadband Technology Opportunities Program to provide broadband service to unserved areas and improve access to broadband service in underserved areas).

II. PUBLIC INTEREST CONSIDERATIONS SUPPORT GRANT OF THIS APPLICATION

As the Commission is aware, Hughes is the global leader in providing broadband satellite network solutions for large enterprises, governments, small businesses and consumers, with more than 1.5 million Very Small Aperture Terminal systems ordered or shipped to customers in over one hundred countries. Hughes pioneered the development of high-speed satellite Internet access services and IP-based networks, which it markets in the United States and globally. Today, Hughes provides and enables a variety of managed network services and equipment that meet unique enterprise customer needs for data, voice and video communications, typically across geographically-dispersed locations. Importantly, Hughes also provides satellite broadband connectivity to approximately 500,000 consumer and small business subscribers in North America.

In August 2007, Hughes Communications, Inc. ("HCI"), parent corporation of Hughes, launched SPACEWAY 3, the company's first Ka-band FSS satellite, into the 94.95° W.L. orbital location.[3] SPACEWAY 3, following a period of in-orbit testing and validation, entered commercial service on April 3, 2008. On May 5, 2010, the FCC's International Bureau granted authority for Hughes to access the U.S. market using the SPACEWAY 4 satellite (also known as Jupiter 107W), to be located at 107.1° W.L.[4]

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[3] In 2008, HCI effected a *pro forma* assignment of the SPACEWAY 3 license (Call Sign S2663) from HCI to Hughes. *See* File No. SAT-ASG-20080213-00041; Letter from Stephen D. Baruch, Counsel to HCI, dated August 11, 2008 (notifying the Commission of the consummation of the assignment).

[4] *See* Hughes Network Systems, LLC, Letter of Intent to Access U.S. Market Using a Non-U.S. Licensed Ka-Band Geostationary Fixed-Satellite Service Satellite at 107.1 W.L. Orbital Location, Stamp Grant, File No. SAT-LOI-20091110-00119 (Call Sign S2753) (granted May 5, 2010)("Jupiter 107W Grant").

SPACEWAY 4 is under construction by Space Systems/Loral, and the satellite is on track to be launched aboard an Arianespace rocket in the first half of 2012.[5]

The addition of Jupiter 91W to the Hughes fleet of spacecraft will further Hughes's commitment to providing satellite broadband connectivity, reinforce the emergence of Ka-band FSS spectrum as a medium for delivery of that connectivity, and introduce new state-of-the-art technology and services in V-band frequencies. The Jupiter 91W satellite's capabilities will speed broadband services to consumers and enterprises at high data rates. With the advanced and flexible design of this satellite, Hughes will be better able to respond to the rapidly expanding needs of its customers, particularly for broadband satellite services throughout the United States. Rural consumers, many of whom cannot be reached by terrestrial broadband providers, will be among the primary beneficiaries of the Jupiter 91W satellite.

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[5] Hughes recently declined Letter of Intent authorizations for two Ka-band GSO FSS satellites to serve the U.S. market, including one for the 90.9° W.L. orbital location. *See* Letters from Stephen D. Baruch, Counsel to Hughes Network Systems, LLC, to Marlene F. Dortch, Secretary, FCC (July 15, 2011). At that time, Hughes plans for additional Ka-band satellites were in a state of flux due to potential changes in orbital locations, frequency plans and customer needs. As a result, Hughes was not in a position to proceed at the time of grant. In declining the authorizations, however, Hughes emphasized that it remains committed to the development of and service to the burgeoning U.S. market for satellite broadband services. The submission of the instant filing is confirmation of this commitment, and constitutes a modified and updated proposal for operation at the 90.9° W.L. orbital location.

III. EFFECTIVE COMPETITTIVE OPPORTUNITIES SHOWING UNDER DISCO II – 47 C.F.R. § 25.137(a)

As a request to access the U.S. market using a foreign-licensed satellite, this Letter of Intent is subject to the Commission's *DISCO II* framework.[6] The *DISCO II* analysis includes consideration of a number of factors, such as the effect on competition in the United States, spectrum availability, eligibility requirements, technical requirements, national security, law enforcement, foreign policy and trade concerns.[7]

A. Effect on Competition in the United States

In *DISCO II,* the Commission established a rebuttable presumption that entry by non-U.S. satellites authorized by World Trade Organization ("WTO") Members to provide services covered by the U.S. commitments under the WTO Basic Telecommunications Agreement will further competition in the United States.[8] The United Kingdom is a member of the WTO, and Hughes seeks to use the requested spectrum to provide satellite services that are covered by the WTO Basic Telecommunications Agreement.[9] Accordingly, the presumption in favor of entry applies to Jupiter 91W.

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[6] *Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Satellites Providing Domestic and International Service in the United States*, Report and Order, 12 FCC Rcd 24094, 24107-17(¶¶ 30-49) (1997) ("*DISCO II*").

[7] *See, e.g., Telesat Canada, Petition for Declaratory Ruling for Inclusion of Anik F2 on the Permitted Space Station List, Petition for Declaratory Ruling to Serve the U.S. Market Using Ka-band Capacity on Anik F2*, Order, 17 FCC Rcd 25287, 25290(¶ 6) (2002).

[8] *DISCO II* at 24112 (¶ 39). *See also* 47 C.F.R. § 25.137(a)(2).

[9] *See Pacific Century Group, Inc.,* 16 FCC Rcd 14356, 14361 (2001) (presuming, consistent with U.S. commitments under the WTO Basic Telecom Agreement, that a U.K.-licensed service provider's provision of any "non-DTH" fixed satellite services in the U.S. will further competition in the U.S market).

Even in the event that particular services to be provided over Jupiter 91W were to fall outside the scope of the WTO accord, [10] the applicable ECO-Sat test would still be satisfied.[11] The U.K. has a telecommunications market that is fully open with respect to foreign-licensed satellites used to deliver DTH services. Under U.K. law, the reception of signals from any foreign-licensed satellite can be prohibited only if the content being transmitted is determined to be illegal and an order specifically proscribing transmission of this content has been adopted.[12] The U.K. policy conforms to the European Union directive specifying that "Member States shall ensure that any regulatory prohibition or restriction on the offer of space segment capacity to any authorised satellite Earth station network operator are abolished . . ."[13] These factors have been relied upon by the Commission to affirm that "the ECO-Sat Test is satisfied for [the United Kingdom, among others] … for DTH service to, from, and within the United States ...."[14]

Allowing Hughes to serve the U.S. by accessing Jupiter 91W will uphold the intent of the WTO Basic Telecommunications Agreement to facilitate fair and open competition in satellite communications services, and provide equivalent opportunities to

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[10] *See DISCO II*, 12 FCC Rcd at 24136 ¶ 98 ("We will apply the ECO-Sat test to requests involving provision of DTH, DBS, and DARS by non-U.S. satellites.").

[11] The test requires the applicant to show that "effective competitive opportunities" exist in the relevant foreign market(s). *See* 47 C.F.R. § 25.137(a).

[12] Such an order must satisfy the conditions described in Article 177 of the [U.K.] Broadcasting Act 1990, as amended by the Communications Act 2003, Schedule 15, ¶ 61.

[13] EC Directive 2002/77/EC on competition in the markets for electronic communications networks and services, OJ L249, Article 7(1), page 21 (September 16, 2002).

[14] *See* SES Americom, Inc.and SES Satellites (Gibraltar) Limited, File No. SAT-ASG-20080609-00120, at 3 (IB, granted August 6, 2008) (authorizing the "reflagging" of AMC-21 from the U.S. to Gibraltar).

serve the U.S. market to facilities licensed in countries that allow U.S.-licensed satellites to access their domestic markets (as the United Kingdom has committed to do, and does). Grant of this Letter of Intent will enhance competition in the U.S. satellite services market by permitting Hughes to introduce expanded satellite broadband services, thereby stimulating lower rates, improved service quality, increased service options, and greater technological innovation. The Commission consistently has relied favorably on these same public interest benefits in granting similar requests.[15]

B. Spectrum Availability

This Letter of Intent proposes to access the U.S. market with Jupiter 91W from the 90.9° W.L. orbital location using segments of the Ka-band designated for primary GSO FSS use, as well as those segments designated for primary nongeostationary ("NGSO") FSS use. In keeping with recent Commission authorization decisions, Hughes emphasizes that its use of the NGSO bands will be on a strictly secondary, non-harmful interference basis.[16]

In addition to the proposed Ka-band operations outlined above, Hughes proposes to include V-band capacity on Jupiter 91W operating in the 47.2-50.2 GHz uplink

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[15] *See, e.g., Digital Broadband Applications Corp.*, 18 FCC Rcd 9455 (2003); *Pegasus Development Corp.*, 19 FCC Rcd 6080 (2004); *DIRECTV Enterprises, LLC, Request for Special Temporary Authority for the DIRECTV 5 Satellite*, 19 FCC Rcd 15529 (2004).

[16] The International Bureau recently granted Hughes such authority for a very similar satellite at this orbital location incorporating an uplink operating at 28.6-29.1 GHz on a secondary basis. *See Hughes Network Systems, LLC*, 26 FCC Rcd 8521, 8524-25 (¶ 11) (Int'l Bur. 2011) ("*Hughes*"). *See also Northrop Grumman Space & Mission Systems Corporation*, 24 FCC Rcd 2330, 2357-2360 (Int'l Bur. 2009), *citing contactMEO Communications, LLC*, 21 FCC Rcd 4047-48 (Int'l Bur. 2006) (Commission authorizes GSO use of primary Ka-band NGSO spectrum based on the applicant's technical showing that its GSO FSS satellites will not interfere with non-Federal NGSO FSS operations).

frequency band and the 39-42.0 GHz downlink frequency band allocated on a co-primary basis for FSS. The V-band capacity will be used for gateway links (at least below 40 GHz on the downlink side and in the 47.2-49.2 GHz band), and also to provide some user capability on a gap-filler basis in the areas where the network's gateway earth stations are located. Consistent with the requirements of Footnote 15 of Section 25.202(a)(1) of the Commission Rules, operations in the lower portions of these bands (39-40.0 GHz downlink and 47.2-48.2 GHz uplink) will be limited to V-band gateway operations in order to avoid possible interference to terrestrial fixed and mobile links that are co-primary in these bands. The upper portions of the band will be utilized for links to more widely deployed user terminals.

Hughes's proposal is fully compliant with the Commission's two-degree spacing requirements, will not cause harmful interference to any other authorized user of the spectrum, and is compatible with future Ka-band and V-band assignments consistent with the FCC's Rules. Therefore, this request is fully consistent with the procedures set forth by the Commission in the *Space Station Licensing Reform Order* regarding processing of GSO-like services.[17]

C. National Security, Law Enforcement, and Public Safety Matters

Grant of this Letter of Intent is consistent with U.S. national security, law enforcement and public safety considerations. Hughes, a U.S. company, will own and control the Jupiter 91W satellite to provide service to customers in the U.S. and potentially parts of Canada and Mexico. The satellite's authorization from the United

[17] *See Amendment of the Commission's Space Station Licensing Rules and Policies*, First Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 10760, 10806 (¶113) (2003).

Kingdom is held by Hughes Network Systems, Limited ("HNS, Ltd."), an indirect wholly-owned subsidiary of Hughes. Hughes has a long history of providing satellite communications services to U.S. government users.

Hughes will be responsible for all aspects of the construction and operation of the Jupiter 91W satellite. HNS, Ltd., as the United Kingdom licensee, will be responsible for and have authority over the satellite network in order to ensure compliance with any rules and obligations established by Ofcom.

HNS, Ltd. is 100 percent owned and controlled by Hughes Network Systems Europe, Ltd. Hughes Network Systems Europe, Ltd. is 100 percent owned and controlled by Hughes.

The directors and officers of these two subsidiaries are listed below.

<u>Hughes Network Systems Europe. Ltd</u>

<u>Directors</u>
Pradman Kaul*
Bahram Pourmand*
Michael Cook*
Christopher Britton
Dean A. Manson

<u>Officers</u>
Christopher Britton
Dean A. Manson*
Claire Denton

* *Also an officer of Hughes Network Systems, LLC*
(See Exhibit in Response to FCC Form 312, Question 40, at 2-3)

Hughes Network Systems, Ltd (UK)

Directors
Bahram Pourmand*
Dean Manson,*
Christopher Britton

Officers
Christopher Britton
Dean A. Manson
Claire Denton

* *Also an officer of Hughes Network Systems, LLC*
(See Exhibit in Response to FCC Form 312, Question 40, at 2-3)

IV. LEGAL AND TECHNICAL INFORMATION – 47 C.F.R. § 25.137(b)

A. Legal Qualifications

As the Commission is aware, Hughes is 100 percent owned and controlled by EchoStar Corporation ("EchoStar"), which is, in turn, controlled by Mr. Charles W. Ergen. Hughes's legal qualifications are set forth in this Letter of Intent and in the attached FCC Form 312 (including associated exhibits). In addition, Hughes's and EchoStar's legal information and qualifications to hold Commission licenses are is also a matter of record in the proceeding through which the FCC approved the transfer of control of Hughes to EchoStar.[18] In any event, this Letter of Intent and its attachments

[18] *See* Hughes Communications, Inc., Transferor, and EchoStar Corporation, Transferee, Consolidated Application for Authority to Transfer Control, Stamp Grant, File Nos. SAT-T/C-20110228-00041, SAT-T/C-20110228-00042, SES-T/C-20110228-00221, SES-T/C-20110228-00222, SES-T/C-20110228-00223 and SES-T/C-20110228-00224, Experimental License File Nos. 0001-EX-TC-2011, 0002-EX-TC-2011 and 0003-EX-TC-2011)(granted June 8, 2011). *See also BRH Holdings GP, Ltd., Transferor and EchoStar Corporation, Transferee,* Applications for Consent to Transfer Control of

include all of the information required for space station applicants in Section 25.114 of the Commission's rules.[19]

B. Technical Qualifications

A complete Technical Annex and two Schedule S submissions for Jupiter 91W are provided as part of this application. The Technical Annex includes the orbital debris mitigation showing required under Section 25.114(d)(14) of the Commission's Rules. 47 C.F.R. § 25.114(d)(14).[20] Separate Schedule S submissions are provided to describe the Ka-band payload and the V-band payload, with information common to both (e.g., expected satellite bus parameters) being repeated in each form.

V. <u>OTHER U.S. REGULATORY REQUIREMENTS – 47 C.F.R. § 25.137(d)</u>

A. Implementation Milestones

Hughes acknowledges the requirement to provide the Commission with anticipated dates for commencement or completion of key milestones in the satellite implementation process consistent with Section 25.114(c)(12) of the Commission's Rules (47 C.F.R. § 25.114(c)(12)), and to meet these milestones consistent with the requirements of Section 25.164(a) of the Commission's Rules (47 C.F.R. § 25.164(a)). Specifically, Hughes plans to implement its Jupiter 91W satellite on the following timetable: (i) execute a binding contract for construction of its satellite prior to the one year anniversary of the grant of this Letter of Intent; (ii) complete Critical Design Review

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Hughes Communications, Inc., Hughes Network Systems, LLC, and HNS License Sub, LLC, Order, 26 FCC Rcd 7976 (IB 2011).

[19] *See* 47 C.F.R. § 25.114.

[20] *See* Attachment A, at Section A.15.

for the spacecraft within two years of grant; (iii) commence physical construction within three years of grant; and (iv) launch the satellite and begin operations within five years of grant.

B. Reporting Requirements

Hughes will comply with all FCC reporting requirements that apply to Ka-band GSO FSS satellites.[21]

C. Compliance with FCC Technical Regulations

Hughes's proposal is fully compliant with the Commission's two-degree spacing requirements, and will not cause harmful interference to any other authorized user of the spectrum.[22] Except with regard to those requirements for which waivers are requested (*see* Section VI, below), Hughes's network will comply fully with the applicable requirements of Part 25 of the Commission's Rules, including power flux-density requirements,[23] full frequency re-use requirements,[24] and all operational requirements. Specific showings as to the applicable elements are contained in this application and the included exhibits and attachments hereto.

In particular, Hughes emphasizes that it includes a quantitative demonstration that its secondary GSO operations in the primary NGSO uplink band at 28.6-29.1 GHz, as well as its operations in the primary NGSO downlink band at 18.8-19.3 GHz, under the

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[21] *See, e.g.*, 47 C.F.R. § 25.145(f).

[22] The Technical Annex shows that Jupiter 91W will be compliant with the Commission's two-degree spacing policy. *See* Attachment A, at Sections A.10 (Ka-band) and A.11 (V-band)**.**

[23] *See* Attachment A, at Section A.8 (Ka-band) and A.9 (V-band).

[24] *See* Attachment A, at Section A.4.

waiver authority requested herein, will not cause harmful interference to present or future users with superior authorization status.[25] In a nutshell, Hughes will be able to operate across the 2 x 500 MHz of NGSO primary spectrum at all times other than when there is insufficient angular separation between an NGSO satellite/associated Earth station and Jupiter 91W or its associated Earth stations. During such in-line events, Jupiter 91W and its Earth stations would not use the NGSO primary bands.[26] There will be sufficient available spectrum on Jupiter 91W to allow Hughes to dynamically shift operations out of the NGSO spectrum for the duration of any in-line events.

D. Posting of Performance Bond

Hughes acknowledges that because the Jupiter 91W satellite for which a spectrum reservation is requested in this Letter of Intent has not yet been constructed, it will be required to post a performance bond pursuant to Section 25.165 of the Commission's Rules (47 C.F.R. § 25.165) upon grant of its request commensurate with its then current stage of implementation of the satellite, up to a maximum of $3 million in the event that it has not executed a binding construction contract at the time of grant.

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[25] *See* Attachment A, at Section A.12.

[26] Hughes notes that the only authorized and proposed NGSO systems in recent years use highly-elliptical orbit satellites that are operationally separated at all times by wide angles from the GSO orbit. This means that there will never be an in-line event between the type of NGSO system that has been authorized and Jupiter 91W. The mechanism Hughes identifies ensures that any future NGSO systems with designs that operationally intersect with the GSO will be protected from harmful interference to the extent contemplated by the Commission's rules and policies. Hughes, of course, will not claim protection from harmful interference that may be caused to Jupiter 91W by such NGSO systems.

E. Spectrum Access Limits

Hughes currently operates a single satellite (SPACEWAY 3 at 94.95° W.L.) in frequency bands overlapping those requested in this Letter of Intent. As noted above, Hughes has previously been authorized to access the U.S. market using the SPACEWAY 4 satellite to be located at 107.1° W.L.[27] In addition, on August 9, 2011, Hughes filed a letter of intent to access the U.S. market from the nominal 97° W.L. orbital location using the proposed Jupiter 97W satellite.[28] Hughes's parent corporation, EchoStar, also operates a single satellite (EchoStar IX at 121° W.L.) in the Ka-band FSS allocation, but has no authorized-but-unbuilt facilities or pending applications in that band. EchoStar's affiliate, DISH Network Corporation, likewise does not have any applied-for or licensed-but-unbuilt satellites in the Ka-band FSS allocation. This is the first application by either Hughes or EchoStar to operate in V-band frequencies. Accordingly, with the filing of the instant LOI for Jupiter 91W, the number of pending co-frequency applications and unbuilt authorizations for Hughes will be three – a total that is within the limit of five market access requests that is established for geostationary satellite network operators in Section 25.137(d)(5) of the Commission's rules.[29]

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[27] *See* Jupiter 107W Grant.

[28] *See* Hughes Network Systems, LLC, Letter of Intent to Access U.S. Market Using a Non-U.S. Licensed Ka-Band Geostationary Fixed-Satellite Service Satellite at the 97.1º W.L. Orbital Location, File No. SAT-LOI-20110809-00148 (Call Sign S2834) (filed Aug. 9, 2011).

[29] Hughes notes that there are also pending two additional letter of intent applications filed by Hughes for the 97° W.L. orbital location. *See* Hughes Network Systems, LLC, Letters of Intent to Access U.S. Market Using a Non-U.S. Licensed Ka-Band Geostationary Fixed-Satellite Service Satellite at the 97.1º W.L. Orbital Location, File Nos. SAT-LOI-20110809-00151, SAT-LOI-20110809-00154) (Call Signs 2837 and 2840, respectively) (filed Aug. 9, 2011). Inasmuch as these submissions are entirely

F. Spectrum Utilization

Hughes seeks authority to use spectrum on a primary basis in the 18.3-18.8 GHz, 19.7-20.2 GHz and 39.0-42.0 GHz bands to support downlink operations and in the 28.35-28.6 GHz, 29.25-29.5 GHz, 29.5-30.0 GHz and 47.2-50.2 GHz bands to support uplink operations. This use is consistent with the Commission's intended use of the primary allocations for GSO FSS in these bands.

Hughes also seeks authority to use spectrum in the 18.8-19.3 GHz band to support downlink operations and spectrum in the 28.6-29.1 GHz band to support uplink operations on a secondary, non-harmful interference basis. Hughes's use of spectrum in the primary NGSO FSS band at 28.6-29.1 GHz to support uplink operations is consistent with the existing secondary allocation to GSO FSS and with the Commission's intended use of the secondary allocation for FSS in this band. Hughes will operate these links consistent with its obligations as a secondary service provider to avoid harmful interference to primary service providers in the band, as well as previously licensed secondary service providers, and to accept any harmful interference received from primary users or previously licensed secondary users. Because the 18.8-19.3 GHz band is allocated only for NGSO FSS operations, without a current secondary allocation for GSO FSS,[30] Hughes is seeking a waiver of Section 2.106 of the FCC's Rules (47 C.F.R.

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duplicative of the prior-filed letter of intent submission in FCC File No. SAT-LOI-20110809-00148 – *i.e.*, they describe and seek authority for precisely the same facility – they should not be counted as additional requests against the limit. *See* note 28, *supra.* Nonetheless, even if these duplicate applications were included in the total, Hughes' aggregate number of authorized-but-unbuilt and applied-for satellite space stations would be five, which remains consistent with the rule.

[30] 47 C.F.R. § 2.106, footnote NG165.

§ 2.106), consistent with precedent, to permit it to operate its downlink operations in the 18.8-19.3 GHz band on a non-harmful interference basis. *See* Section VI.B., below.

VI. <u>WAIVER REQUESTS</u>

In this section, Hughes sets forth its requests and contingent requests for waivers of Commission Rules. Hughes presents the waivers and contingent waivers to ensure that the Commission's requirements for application contents are satisfied. The Commission will grant a waiver of its rules for good cause shown.[31]

A. Section 25.114(c)(4)(iii)

Hughes requests a partial waiver of Section 25.114(c)(4)(iii) of the Commission's Rules (47 C.F.R. § 25.114(c)(4)(iii)), which requires applications to provide beam interconnectivity information.

The Jupiter 91W satellite network has fifteen primary gateways and two backup gateways at Ka-band. The interconnectivity between the fifteen gateway beams and all the user beams has been provided in the associated Ka-band Schedule S form. The two backup gateways -- Gateways 16 and 17 -- will only be pressed into service in the event of a failure of one of the fifteen primary gateway chains. The satellite is designed to allow each of the backup gateway beams to be interconnected with any of the user beams in both the forward and return directions.

For the fifteen primary gateway beams, there are a total of 170 forward link interconnections and 330 return link interconnections for a total of 500 interconnections. All of these are shown in Section S.10 of the Ka-band Schedule S form. In order to show

[31] *See* 47 C.F.R. § 1.3. *See also WAIT Radio. v. FCC*, 459 F.2d 1203 (1972).

the beam interconnectivity for the two backup gateway beams in the Schedule S form, there would be 1,000 additional beam interconnections (500 for each of the two backup gateway beams).

A partial waiver of Section 25.114(c)(4)(iii) is appropriate in this instance, as the requirement of the rule is satisfied with respect to all of the primary interconnections on Jupiter 91W. For either of the two backup gateways to come into use, one of the fifteen gateways for which interconnection data have been provided would have to have failed or otherwise been pulled from service, and the back-up gateway would have to have assumed its function. In this way, the purpose of the rule is satisfied, as Hughes has provided the data for all potential operational beams.

Because it would be burdensome on Hughes to include the additional 1,000 beam interconnections – interconnections essentially associated with spare/redundant capacity -- in the associated Schedule S form, Hughes respectfully requests that the Commission accept the entries that have been provided for the primary gateway beams as compliant with the objective of Section 25.114(c)(4)(iii) and grant a partial waiver of the regulation that relieves Hughes of the substantial burden of providing the additional 1,000 beam/channel combinations for the backup gateway beams. With the interconnection data having been supplied for all operational beams, granting Hughes's request for a partial waiver is not inconsistent in any way with the rule's purpose, and is fully consistent with the public interest.[32]

[32] The International Bureau granted Hughes an identical waiver for the SPACEWAY 6 satellite in *Hughes*, 26 FCC Rcd at 8524 (¶ 10).

B. Section 2.106: Allocation Table -- 18.8-19.3 GHz Downlink

Hughes also requests a waiver of Section 2.106, Footnote NG165 of the Commission's Rules. The 18.8-19.3 GHz band is currently designated only for NGSO FSS operations.[33] Hughes seeks to use this spectrum for secondary downlink operations, and therefore requests a waiver of Section 2.106, Footnote NG165 of the Commission's Rules (47 C.F.R. § 2.106, footnote NG165) to permit it to operate downlinks in the 18.8-19.3 GHz band on a non-harmful interference basis. The Commission has granted similar waivers in the past for GSO FSS operations in this frequency band.[34] There continues to be ample good cause for granting such a waiver. Hughes proposes to use spectrum that would otherwise continue to lie fallow, or in any event underutilized, as commercial NGSO Ka-band systems remain unrealized.

C. Contingent Waiver of Sections 25.156(d)(3) and 25.202(g)

A modest waiver of the processing approach established under Section 25.156(d)(3) of the Commission's rules may also be necessary. This rule specifies that applications for "systems employing two or more service bands will be treated like separate applications for each service band" (47 C.F.R. § 25.156(d)(3)), permitting the application to be granted in parts by the Commission on separate processing tracks. This processing approach would pose a special problem for Hughes because its Ka-band and V-band proposals are mutually interdependent. The V-band component cannot reasonably be implemented without the Ka-band component, and the Ka-band component must proceed on a timetable that allows the V-band package to be integrated with it.

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[33] 47 C.F.R. § 2.106, footnote NG165.

[34] *See* note 14, *supra*. *See also Hughes*, 26 FCC Rcd at 8525 (¶ 13).

Accordingly, to the extent necessary, Hughes requests that the Commission waive Section 25.156(d)(3) of its rules to allow both the Ka-band and V-band portions of its satellite proposal to be considered and acted upon contemporaneously. The system concept is fundamentally dependent on use of the two bands together, and Hughes would not be able to proceed with construction in one band without assurance that spectrum in the other band will also be assigned. This treatment appears consistent with the approach the Commission has stated it would follow in connection with hybrid satellite proposals, acting simultaneously on the requests for each band.[35]

If Section 25.156(d)(3) is read literally – that Hughes' proposal to operate in both Ka-band and V-band must be considered as separate applications for spectrum access – then an additional waiver of Section 25.202(g) may also be needed to enable Hughes to include its TT&C on-orbit links at the band-edge of the Ka-band service bands alone, rather than having such links at the edge of both the Ka-band and V-band service bands. The efficiencies of including only one set of TT&C links in the service bands to be included on a hybrid, multi-band satellite are self-evident, and reflect only a portion of the efficiencies and economies of scale that hybrid payloads permit. Accordingly, good cause exists for the grant of this request, if deemed required, which is itself contingent on a finding that Section 25.156(d)(3) of the Rules contemplates that Section 25.202(g) would apply independently to each of frequency band employed on an integrated, hybrid satellite.

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[35] *See Space Station Licensing Reform Order*, 18 FCC Rcd 10760, 10817 (¶ 147)(2003).

VII. CONCLUSION

In summary, the proposed Jupiter 91W satellite is fully compliant with FCC rules relating to Ka-Band blanket licensing, V-band FSS, system performance, flexibility, service quality, overall capacity, and spectrum efficiency, and will provide a platform capable of offering more advanced broadband services.

For the reasons stated above, Hughes urges the Commission to conclude that the grant of an authorization for the proposed Jupiter 91W Ka-/V-band GSO FSS satellite network at the 90.9º W.L. orbital location is fully consistent with the public interest. Hughes respectfully requests that the Commission expeditiously grant this application.

Respectfully submitted,

Hughes Network Systems, LLC

By:___________________________
Steven Doiron
Senior Director, Regulatory Affairs

December 20, 2011

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Attachment A

TECHNICAL INFORMATION TO SUPPLEMENT SCHEDULE S

ENGINEERING CERTIFICATION

I, Steven Doiron, hereby declare, under penalty of perjury, that the following statements are true and correct to the best of my information and belief:

(i) I am the technically qualified person responsible for the engineering information contained in the foregoing Application,

(ii) I am familiar with Part 25 of the Commission's Rules, and

(iii) I have either prepared or reviewed the engineering information contained in the foregoing Application and found it to be complete and accurate.

By:______________________________

Steven Doiron, P. Eng.
Senior Director, Regulatory Affairs
Hughes Network Systems, LLC

Dated: December 20, 2011

ATTACHMENT A

Technical Information to Supplement Schedule S

A.1 SCOPE AND PURPOSE

The purpose of this Attachment is to provide the Commission with the technical characteristics of the JUPITER 91W satellite. This attachment contains the information required by 47 C.F.R. §25.114 and other sections of the FCC's Part 25 rules that cannot be entered into the Schedule S submission.

A.2 GENERAL DESCRIPTION

The JUPITER 91W satellite will operate at the nominal 91° W.L. orbital location and will provide high-speed services using both the Ka-bands and V-band bands. The Ka-band payload will provide services primarily to CONUS, but also to parts of Canada and Mexico. The V-band payload will provide services to the drier, mid-western regions of CONUS -- i.e., those areas not served by the Ka-band payload.

With respect to the Ka-band payload, the satellite will operate in the 28.35-29.1 GHz and 29.25-30.0 GHz bands (Earth-to-space) and the 18.3-19.3 GHz and 19.7-20.2 GHz bands (space-to-Earth). Uplink transmissions in the 28.35-29.1 GHz band will only be transmitted by the gateway antennas; no blanket-licensed subscriber antennas will use the band. Uplink transmissions from the subscriber antennas will be restricted to the 29.25-30.0 GHz bands. Uplink transmissions from the gateway antennas can utilize any of the uplink Ka-bands.

With respect to the V-band payload, the satellite will operate in the 47.2-50.2 GHz band (Earth-to-space) and the 39.0-42.0 GHz band (space-to-Earth). Subscriber antennas will use the 49.2-

50.2 GHz band for Earth-to-space transmissions (return links) and the 40.0-42.0 GHz band (forward links) to receive space-to-Earth transmissions.

For both the Ka-bands and V-bands, the satellite uses both left and right hand circular polarization (LHCP and RHCP) together with beam separation to achieve full frequency re-use at acceptable levels of co- and cross-polarized intra-system interference.

The satellite utilizes a bent-pipe architecture with asymmetric forward (gateway-to-subscriber) and return (subscriber-to-gateway) links. Forward links consist of a single TDM 250 MHz wide carrier, while the return links use MF-TDMA with a variety of bandwidths/data rates employed. The network uses adaptive coding and modulation to combat rain fades. That is, the modulation type, amount of coding and/or user data rate is dynamically varied to meet the link requirements during rain events.

As explained in section A.15.3, Hughes proposes to offset the satellite by 0.1° from 91º W.L. and to center the station-keeping box at 90.9° W.L

A.3 SPACE STATION TRANSMIT AND RECEIVE CAPABILITY

The JUPITER 91W satellite's antenna gain contours for the receive and transmit beams, as required by §25.114(d)(3), are given in GXT format. However, because of the large number of beams involved and the known problems of the Schedule S software in handling a large number of beams, the GXT files have not been embedded in the Schedule S software file and are being provided separately to the Commission.

A.3.1 Ka-Band

The JUPITER 91W satellite's beam coverage, for both transmit and receive, will consist of 15 primary gateway beams and 60 user beams. There are also two backup gateway spot beams used to provide redundancy in the event of a failure. The gateway spot beams are nominally the same with a peak downlink EIRP of 65 dBW and a peak G/T of 22 dB/K. The user spot beams are nominally the same with a peak downlink EIRP of 67 dBW and a peak G/T of 22 dB/K.

A.3.2 V-Band

The JUPITER 91W satellite's V-band beam coverage, for both transmit and receive, will consist of 16 gateway beams and 16 user beams, all located in the drier, mid-western regions of CONUS. The gateway spot beams are nominally the same with a peak downlink EIRP of 64 dBW and a peak G/T of 22 dB/K. The user spot beams are nominally the same with a peak downlink EIRP of 70 dBW and a peak G/T of 22 dB/K.

A.4 FREQUENCY AND POLARIZATION PLAN

The JUPITER 91W satellite's Ka-band and V-band frequency plan and beam inter-connectivity is provided in the associated Schedule S forms. For both Ka-band and V-band, the forward links are divided into 250 MHz channels, while the return links are divided into 125 MHz channels. Circular polarization is used on both the uplink and downlink with the downlink polarization being orthogonal to the uplink polarization. For the Ka-band, the satellite will employ a four-fold frequency re-use pattern such that any channel is re-used multiple times by a combination of polarization and spatial isolation. For the V-band, each channel is used four times through a combination of polarization and spatial isolation. For both bands, the requirements of §25.210(d) of the Rules are satisfied.

A.5 SERVICES TO BE PROVIDED

The JUPITER 91W satellite will provide a variety of FSS services including direct-to-home, high speed personal computer access to the Internet, videoconferencing and high capacity two-way communications. Representative link budgets, which include details of the transmission characteristics, performance objectives and earth station characteristics, are provided in the associated Schedule S submission.

A.6 TT&C CHARACTERISTICS

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

The TT&C sub-system provides for communications during pre-launch, transfer orbit and on-station operations, as well as during spacecraft emergencies. Beacon transmissions are used to control on-station spacecraft attitude, gateway uplink power control and the pointing of the satellite's antennas. All TT&C functions utilize the Ka-band only and the TT&C sub-system will operate at the edges of the 30/20 GHz frequency bands during all phases of the mission.

During transfer orbit and on-station emergencies the TT&C subsystem employs a dual omni-directional antenna configuration. During normal on-station operation, the telecommand transmissions will be received via one of two uplink gateway beams (primary plus backup). The TT&C earth station locations have not yet been finalized, however it is expected that the TT&C earth stations will be located in Castle Rock, CO and Fillmore, CA.

A.7 CESSATION OF EMISSIONS

All downlink transmissions can be turned on and off by ground telecommand, thereby causing cessation of emissions from the satellite, as required.

A.8 KA-BAND POWER FLUX DENSITY AT THE EARTH'S SURFACE

§25.208(c) contains PFD limits that apply in the 18.3-18.8 GHz band. The PFD limits of §25.208(c) are 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;

- $-115+(\delta-5)/2$ 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 produced by emissions from a space station under assumed free-space propagation conditions as follows:

- -95 dB(W/m^2) for all angles of arrival. This limit may be exceeded by up to 3 dB for no more than 5% of the time.

§25.208 does not contain any PFD limits that apply in the 18.8-19.3 GHz band for GSO satellite networks, however it is noted that Article 21 of the ITU Radio Regulations does include PFD limits applicable to GSO satellites using the 18.8-19.3 GHz band and these limits are identical to those in §25.208(c).

Compliance with the applicable FCC and ITU PFD limits is demonstrated below using a simple worst-case methodology. The maximum downlink EIRP that the JUPITER 91W satellite can transmit in the Ka-band is 67 dBW in 250 MHz. The shortest distance from the satellite to the Earth is 35,786 km, corresponding to a spreading loss of 162.06 dB. Therefore the maximum possible PFD at the Earth's surface could not exceed -95.06 dBW/m^2 in the 250 MHz usable bandwidth (i.e., 67 -162.06). Allowing for the use of digital modulation with an almost flat spectrum, the corresponding maximum PFD at an elevation angle of 90° measured in a 1 MHz band would not exceed -119.0 dBW/m^2. The -119 dBW/m^2/MHz level is less than the -115 dBW/m^2/MHz PFD limit value that applies at elevation angles of 5° and below. Therefore compliance with the PFD limits is assured.

In addition, §25.208(d) provides an additional aggregate PFD limit in the 200 MHz wide band 18.6-18.8 GHz of -95 dBW/m^2. In the worst case, this would correspond to a PFD limit of -118 dBW/m^2/MHz (i.e., -95-10*log(200)). As demonstrated in the previous paragraph, downlink transmissions from the JUPITER 91W satellite cannot exceed -119 dBW/m^2/MHz at any angle of arrival and therefore compliance with §25.208(d) is also assured.

A.9 V-BAND POWER FLUX DENSITY AT THE EARTH'S SURFACE

This section demonstrates that the V-band payload of the JUPITER 91W satellite will not exceed the applicable geostationary space station PFD limits of §25.208.

A.9.1 39.0-40.0 GHz Band PFD Limits

The satellite does not increase the downlink EIRP to compensate for attenuation due to rain, therefore there is only a need to demonstrate compliance with the more stringent, free-space PFD limits of §25.208(q)(1), which is applicable to the 37.5-40.0 GHz band. The PFD limits of §25.208(q)(1) are as follows:

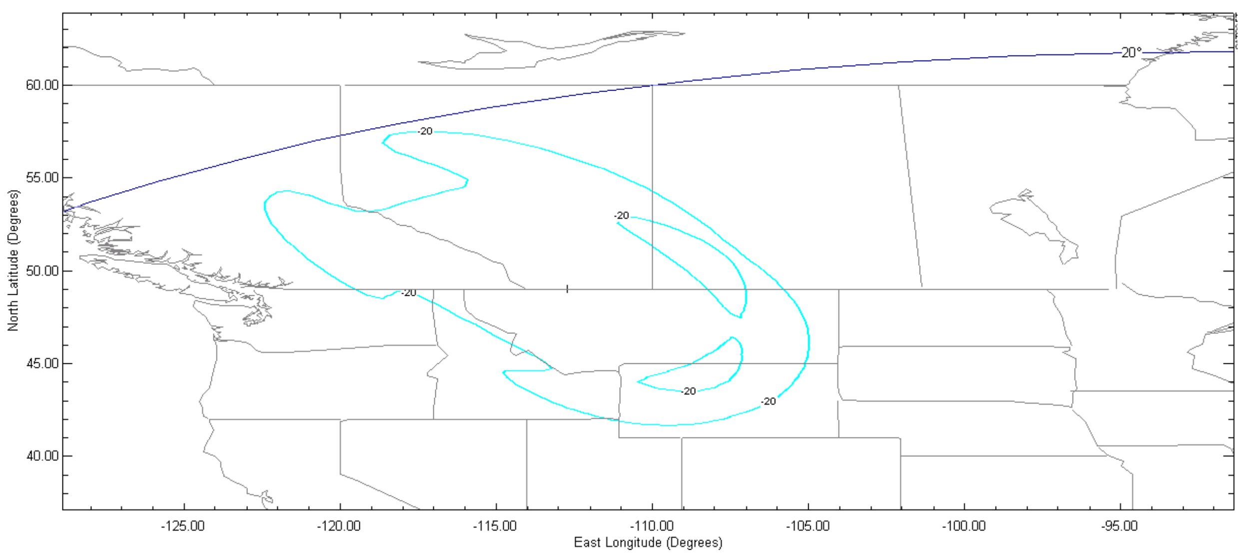
- −139 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- −139 + 4/3 (δ−5) dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 20 degrees above the horizontal plane; and
- −119 + 0.4 (δ−20) dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 20 and 25 degrees above the horizontal plane;
- −117 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;

In the 39.0-40.0 GHz band, the maximum downlink EIRP density that the JUPITER 91W satellite will transmit is -17 dBW/Hz, which is equivalent to 43 dBW/MHz. The shortest distance from the satellite to the Earth is 35,786 km, which corresponds to a spreading loss of 162.06 dB. Therefore the maximum possible PFD at the Earth's surface could not exceed approximately -119 dBW/m^2/MHz (i.e., 43-162.06) at an elevation angle of 90 degrees. The PFD over the JUPITER 91W satellite's actual service area will be necessarily slightly lower due to the longer slant paths at lower elevation angles.

All beam centers of the satellite's gateway beams are located at elevation angles greater than 20 degrees (actually, greater than 25 degrees), therefore the satellite meets the PFD limits at elevation angles of 20 degrees and higher.

The boresight of the satellite's northern-most beam has the lowest elevation angle of all beams of the JUPITER 91W satellite, thus we focus on this beam in order to demonstrate compliance of the PFD limits at elevation angles below 20 degrees. The -20 dB contour of the beam is shown in Figure 9-1. It can be seen that the beam is at least 20 dB down at an elevation angle of 20 degrees, therefore the maximum PFD level of the JUPITER 91W satellite at elevation angles below 20 degrees will be less than: -119 - 20 = -139 dBW/m^2/MHz, which meets or is lower than the §25.208(q)(1) PFD limits for elevation angles below 20 degrees. All other V-band beams are also at least 20 dB down at an elevation angle of 20 degrees.

Figure 9-1. -20 dB contour of the Cut Band, Montana beam (beams VD9L and VD9R).



A.9.2 40.0-42.0 GHz Band PFD Limits

There are two sets of PFD limits that apply to the 40.0-42.0 GHz band: §25.208(s), which applies to the 40.0-40.5 GHz band, and §25.208(u), which applies to the 40.5-42.0 GHz band. The latter is the more stringent of the two. As demonstrated below, the JUPITER 91W satellite complies with the PFD limits of §25.208(u) and therefore also complies with the limits of §25.208(s). The PFD limits of §25.208(u) are as follows:

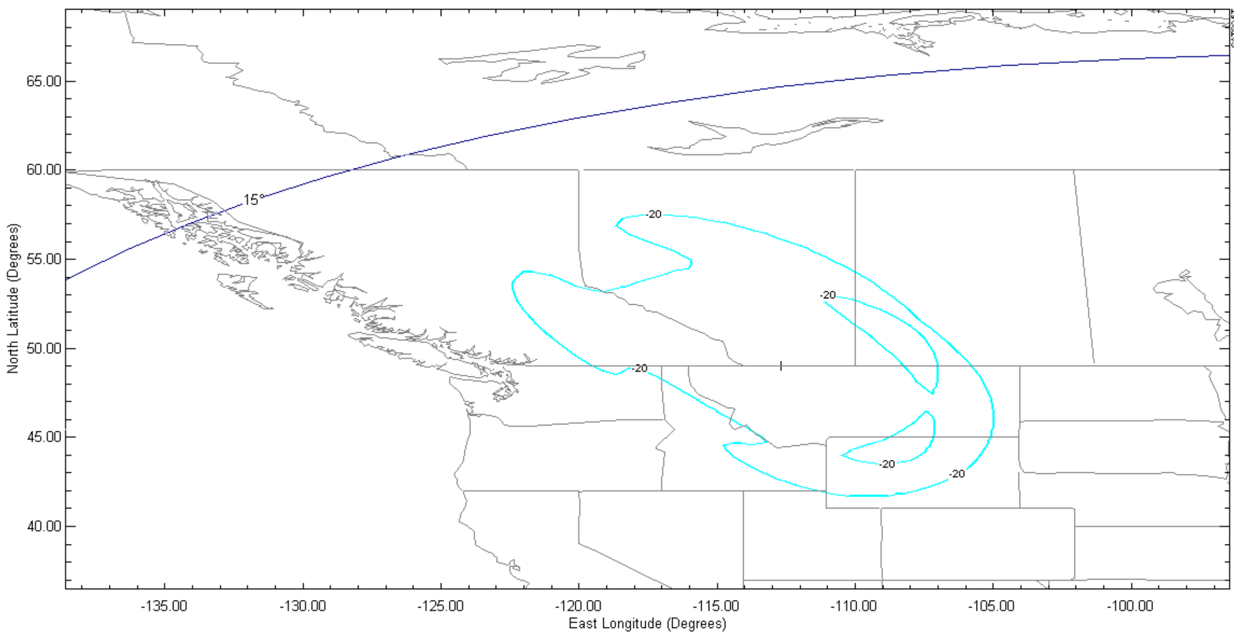
- −120 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- −120 + (δ−5) dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 15 degrees above the horizontal plane;
- −110 + 0.5 (δ−15) dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 15 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 the 40.0-42.0 GHz band, the maximum downlink EIRP density that the JUPITER 91W satellite will transmit is -14 dBW/Hz, which is equivalent to 46 dBW/MHz. The shortest distance from the satellite to the Earth is 35,786 km, which corresponds to a spreading loss of 162.06 dB. Therefore the maximum possible PFD at the Earth's surface could not exceed approximately -116 dBW/m^2/MHz (i.e., 46-162.06). The PFD over the JUPITER 91W satellite's actual service area will be necessarily slightly lower due to the longer slant paths.

All beam centers of the satellite's user beams are located at elevation angles greater than 15 degrees, where the applicable PFD limit is -110 dBW/m^2/MHz , therefore the satellite meets the PFD limits at elevation angles of 15 degrees and higher.

The satellite's northern-most beam has the lowest elevation angle of all beams of the JUPITER 91W satellite, thus we focus on this beam in order to demonstrate compliance of the PFD limits at elevation angles below 15 degrees. The -20 dB contour of the beam is shown in Figure 9-2. It can be seen that the beam is at least 20 dB down at an elevation angle of 15 degrees, therefore the maximum PFD level of the JUPITER 91W satellite at elevation angles below 15 degrees will be less than: -116 - 20 = -136 dBW/m^2/MHz, which is lower than the §25.208(u) PFD limits for elevation angles below 15 degrees. All other V-band beams are also at least 20 dB down at an elevation angle of 15 degrees.

Figure 9-2. -20 dB contour of the Cut Bank, Montana beam (beams UD9L and UD9R).



A.10 KA-BAND TWO DEGREE COMPATIBILITY

All Ka-band transmissions of the JUPITER 91W satellite network will not exceed the uplink off-axis EIRP density and downlink PFD levels of §25.138, regardless of whether the frequency band used is subject to §25.138.

A.10.1 Frequency Bands Subject to §25.138

For those frequency bands subject to §25.138, compliance with the Commission's two-degree spacing policy is assured provided:

1) The uplink off-axis EIRP density levels of §25.138(a)(1) of the Rules for blanket licensing are not exceeded;

2) The maximum PFD levels are lower than the PFD values given in §25.138(a)(6) of the Rules.

The clear sky uplink off-axis EIRP density limits of §25.138(a)(1) are equivalent to a maximum uplink input power density of -56.5 dBW/Hz. Table 10-1 compares the uplink input power densities derived from the uplink link budgets that are contained in the Schedule S form with the clear sky limits of §25.138 (a)(1) of the Rules. It can be seen that in all cases the clear sky uplink power limits are met. No authorized uplink transmissions towards the JUPITER 91W satellite will exceed the clear sky uplink off-axis EIRP density limits of §25.138(a)(1). In addition, authorized transmitting earth station antennas will meet the requirements of §25.209(a) and (b).

Table 10-1. Demonstration of Compliance with the Uplink Power limits of §25.138 (a)(1).

Uplink Antenna Size	Emission	Maximum Clear Sky Uplink Input Power Density (dBW/Hz)	Clear Sky Uplink Input Power Density Limit of §25.138 (a)(1) (dBW/Hz)	Excess Margin (dB)
74 cm	3M67G7W	-62.6	-56.5	6.1
74 cm	1M22G7W	-57.9	-56.5	1.4
74 cm	612KG7W	-57.9	-56.5	1.4
3.5 m	250MG7W	-70.9	-56.5	14.8

Section A.8 above demonstrates that the maximum PFD that could be transmitted by the JUPITER 91W satellite, at an elevation angle of 90 degrees, is -119 dBW/m^2/MHz and therefore the PFD levels at other elevation angles will necessarily be somewhat lower. In fact, the true maximum PFD that can occur within the JUPITER 91W satellite's service area occurs with user beam #58; the southern-most beam. The distance between the satellite and the boresight of user beam #58 is 36645 km (elevation angle of 57.5°), which corresponds to a spreading loss of 162.27 dB. Therefore the maximum PFD that can occur on the Earth's surface is 67 - 10*log(250) - 162.27 = -119.25 dBW/m^2/MHz.

Intelsat North America LLC ("Intelsat") has a pending application before the Commission for the Ka-band GALAXY KA satellite, which is proposed to be operated at 89.1°W.L.[1] While the proposed JUPITER 91W orbital location is slightly less than two degrees from the nominal 89° W.L., the interference from the JUPITER 91W satellite into the proposed GALAXY KA satellite is within the interference environment allowed by the blanket licensing limits of §25.138 for a two-degree orbital separation, as discussed below.

Assuming the all earth station antennas conform to the performance standards of § 25.209, the additional interference caused by the reduced orbital separation is 25*log(2 / 1.8) = 1.14. As demonstrated in Table 10-1, the uplink margins relative to §25.138(a)(1) are above this value. On the downlink, the maximum possible PFD caused by the JUPITER 91W satellite is -119.25 dBW/m^2/MHz, which also provides some margin (1.25 - 1.14 = 0.11 dB) above this value relative to §25.138(a)(6).

The preceding demonstrates that, despite the 1.8 degree orbital separation, the JUPITER 91W satellite network's operations will not cause more interference into the planned GALAXY KA satellite network than that allowed by the blanket licensing limits of §25.138 with a two-degree orbital separation.

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1 *See* SAT-AMD-20100302-00038.

In addition, to the GALAXY KA network, Intelsat operates the GALAXY-28 satellite at 89° W.L. (1.9° separation), New DBSD operates the ICO G1 satellite and at 92.85°W (1.95° separation) and ViaSat, Inc ("ViaSat") has a pending application before the Commission to operate the VIASAT-89W satellite at 88.9° W.L. (2° separation). Because these additional operational and planned satellites have an orbital separation from 90.9° W.L. greater than 1.8 degrees, they will also receive less interference than that allowed by the blanket licensing limits of §25.138 for a two-degree orbital separation.

A.10.2 Frequency Bands Not Subject to §25.138

This section demonstrates that uplink transmissions in the 28.6-29.1 GHz bands and downlink transmissions in the 18.8-19.3 GHz band are two-degree compatible.

Currently there are no operational GSO Ka-band satellites that use the 28.6-29.1 GHz and 18.8-19.3 GHz bands within two degrees of the 90.9º W.L. location. ViaSat has a pending application before the Commission for the Ka-band VIASAT-89W satellite at the 88.9º W.L. location.[2] ViaSat seeks authority to use the 28.6-29.1 GHz and 18.8-19.3 GHz bands in addition to the "GSO" Ka-bands.

Tables 10-2 and 10-3 provide a summary of the uplink and downlink transmission parameters of the JUPITER 91W and VIASAT-89W satellite networks, respectively. The parameters in Table 10-2 were derived from the JUPITER 91W link budgets that are embedded in the associated Schedule S form, while the parameters in Table 10-3 were taken from ViaSat's application.

Interference calculations were performed using the transmission parameters in Tables 10-2 and 10-3. The interference calculations assumed a 1 dB advantage for topocentric-to-geocentric conversion, all wanted and interfering carriers are co-polarized and all earth station antennas

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[2] *See* SAT-AMD-20100831-00186.

conform to a sidelobe pattern of 29-25 log(θ). The C/I calculations were performed on a per Hz basis.

Table 10-4 shows the results of the interference calculations in terms of the overall C/I margins. The table is provided in a format similar to that of the output of the Sharp Adjacent Satellite Interference Analysis program. It can be seen that the C/I margins are positive in all cases.

Note that the JUPITER 91W satellite network's return links (i.e., subscriber-to-gateway links) do not use the 28.6-29.1 GHz band. Accordingly, the C/I calculations for certain interferer/victim carrier combinations only calculate the downlink interference. The grayed cells in Table 10-4 are overall C/I margins (i.e., combined uplink and downlink C/I margins), while the non-grayed cells are downlink C/I margins only.

Table 10-2. JUPITER 91W transmission parameters.

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	250MG7W	250	58.9	72.0	64.0	42.1	21.5
2	250MG7W	250	58.9	72.0	64.0	42.1	20.4
3	250MG7W	250	58.9	72.0	64.0	42.1	18.8
4	3M67G7W	3.67	N/A	N/A	43.7	55.3	20.4
5	1M22G7W	1.22	N/A	N/A	38.9	55.3	19.3
6	612KG7W	0.612	N/A	N/A	35.9	55.3	18.7
7	612KG7W	0.612	N/A	N/A	35.9	55.3	10.9

Table 10-3. VIASAT-89W transmission parameters.

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
8	110MG7D	110	65.0	70.0	44.0	61.4	17.3
9	110MG7D	110	65.0	75.0	44.0	61.4	20.6
10	25M0G7D	25	65.0	71.2	35.5	61.4	20.6
11	25M0G7D	25	65.0	62.7	35.5	61.4	14.8

Table 10-4. Summary of the C/I margins (dB).

		Interfering Carriers										
	Carrier ID	1	2	3	4	5	6	7	8	9	10	11
Wanted Carriers	1	0.1	0.1	0.1	2.1	2.1	2.1	2.1	15.4	13.5	12.6	17.1
	2	1.2	1.2	1.2	3.2	3.2	3.2	3.2	16.5	14.6	13.7	18.2
	3	2.8	2.8	2.8	4.8	4.8	4.8	4.8	18.1	16.2	15.3	19.8
	4	12.5	12.5	12.5	14.5	14.5	14.5	14.5	28.9	28.9	31.0	31.0
	5	13.6	13.6	13.6	15.5	15.6	15.6	15.6	30.0	30.0	32.1	32.1
	6	14.2	14.2	14.2	16.1	16.2	16.2	16.2	30.6	30.6	32.7	32.7
	7	22.0	22.0	22.0	23.9	24.0	24.0	24.0	38.4	38.4	40.5	40.5
	8	7.1	7.1	7.1	9.2	9.2	9.2	9.2	22.1	19.9	18.7	23.8
	9	3.9	3.9	3.9	5.9	5.9	5.9	5.9	19.8	18.8	18.8	21.7
	10	1.8	1.8	1.8	3.8	3.8	3.8	3.8	18.1	17.7	18.8	20.1
	11	7.6	7.6	7.6	9.6	9.6	9.6	9.6	22.9	21.0	20.0	24.6

A.11 V-BAND TWO DEGREE COMPATIBILITY

This section demonstrates that the V-band transmissions of the JUPITER 91W satellite network are two-degree compatible.

Currently there are no operational or proposed V-band satellites that use the 47.2-50.2 GHz and 39.0-42.0 GHz bands within two degrees of the 90.9º W.L. location. In order to demonstrate two-degree compatibility, the transmission parameters of the JUPITER 91W satellite have been assumed as both the wanted and victim transmissions.

Table 11-1 provides a summary of the uplink and downlink transmission parameters. These parameters were derived from the JUPITER 91W clear-sky link budgets that are embedded in the Schedule S form and were used in the interference analysis. The interference calculations assumed a 1 dB advantage for topocentric-to-geocentric conversion, all wanted and interfering carriers are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log(θ). The C/I calculations were performed on a per Hz basis.

Table 11-2 shows the results of the interference calculations in terms of the C/I margins. The table is provided in a format similar to that of the output of the Sharp Adjacent Satellite Interference Analysis program. It can be seen that the C/I margins are positive in all cases.

Table 11-1. JUPITER 91W V-band transmission parameters

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	250MG7W	250	63.0	76.1	67.0	48.1	21.5
2	250MG7W	250	63.0	76.1	67.0	48.1	20.4
3	250MG7W	250	63.0	76.1	67.0	48.1	18.8
4	3M67G7W	3.67	49.8	55.9	43.7	61.4	20.4
5	1M22G7W	1.22	49.8	55.9	38.9	61.4	19.3
6	612KG7W	0.612	49.8	55.9	35.9	61.4	18.7
7	612KG7W	0.612	49.8	55.9	35.9	61.4	10.9
8	125MG7W	125	63.3	73.3	62.0	61.4	20.4

Table 11-2. Summary of the C/I margins (dB).

		Interfering Carriers							
	Carrier ID	1	2	3	4	5	6	7	8
Wanted Carriers	1	6.1	6.1	6.1	7.4	4.0	1.5	1.5	8.0
	2	7.2	7.2	7.2	8.5	5.1	2.6	2.6	9.1
	3	8.8	8.8	8.8	10.1	6.7	4.2	4.2	10.7
	4	14.3	14.3	14.3	8.7	4.1	1.2	1.2	15.7
	5	16.2	16.2	16.2	14.1	9.8	7.0	7.0	17.9
	6	17.0	17.0	17.0	17.0	13.1	10.4	10.4	18.9
	7	24.8	24.8	24.8	24.8	20.9	18.2	18.2	26.7
	8	17.1	17.1	17.1	10.9	6.3	3.3	3.3	18.4

A.12 SHARING WITH NGSO FSS IN THE 28.6-29.1 GHZ AND 18.8-19.3 GHZ BANDS

The 28.6-29.1 GHz band is allocated to NGSO FSS on a primary basis and it is allocated to GSO FSS on a secondary basis. Stations operating in a secondary service cannot cause harmful interference to or claim protection from harmful interference from stations of a primary service. The 18.8-19.3 GHz band is allocated exclusively to NGSO FSS. In bands designated for exclusive use, non-conforming services may only be provided on a non-harmful interference basis to any licensed service provided in accordance with the Table of Allocations, and may not claim interference protection from other authorized services.

In order to prevent the JUPITER 91W satellite network from causing harmful interference into NGSO satellite networks using the 28.6-29.1 GHz and 18.8-19.3 GHz bands, the JUPITER 91W satellite and its associated earth stations will cease transmissions in these bands during all potential interference conditions. The highest interference levels that could occur into NGSO networks from the JUPITER 91W network are when there is an "in-line" event. On the uplink for example, an in-line event occurs when the NGSO satellite, the GSO satellite and the interfering GSO earth station are all in a line. As the NGSO satellite continues to move within its orbit, an angle between the NGSO satellite and the GSO satellite, subtended at the GSO earth station, is created. As long as the GSO earth station does not transmit when the NGSO satellite is within a certain angle, no harmful interference to the NGSO satellite will occur. A similar situation exists on the downlink. The amount of angular separation required will be dependent on the parameters of the NGSO FSS networks, their earth station locations, and their interference criteria.

Currently there are no NGSO networks authorized by the Commission to use the 28.6-29.1 GHz and 18.8-19.3 GHz bands. Northrop Grumman Space and Mission Systems Corp. ("Northrop Grumman") had previously received Commission authorization for its Global EHF Satellite Network ("GESN") and ATCONTACT Communications, LLC ("ATCONTACT") had previously received Commission authorization for its NGSO network. Both networks were to utilize highly elliptical orbits ("HEO"). The interference analysis contained herein demonstrates that the operations of the JUPITER 91W satellite network would protect the HEO satellite systems previously licensed to AtContact and NGST from harmful interference.

O3b Limited ("O3b") has applied for U.S. market access for its constellation of NGSO satellites.[3] O3b proposes to communicate with a gateway earth station to be located in Hawaii using the 28.6-29.1 GHz and 18.8-19.3 GHz bands. Interference analysis provided herein demonstrates that no harmful interference between O3b's system, as proposed, and the JUPITER 91W satellite network will occur.

[3] *See* SES-LIC-20100723-00952.

A.12.1 Sharing with the NGST and AtContact HEO Systems

Table 12-1 summarizes the salient parameters of the GESN and ATCONTACT HEO satellite networks. These parameters are identical to those used by Northrop Grumman and ATCONTACT to demonstrate independently that their GSO operations in the 28.6-29.1 GHz and 18.8-19.3 GHz bands were compatible with the other's proposed NGSO operations.[4] It can be seen that the two networks' orbital and transmission parameters are identical, which allows a single interference analysis to be performed.

Table 12-1. GESN and ATCONTACT HEO satellite characteristics.

	GESN	ATCONTACT
Orbital parameters		
• # of satellites	3	3
• # of planes	3	3
• # of satellites per plane	1	1
• Inclination	63.4°	63.4°
• Apogee	39352 km	39352 km
• Perigee	1111 km	1111 km
• Minimum Tx altitude	16000 km	16000 km
Satellite Rx gain	46.5 dBi	46.5 dBi
Satellite Rx system noise temp.	504 K	504 K
Earth station uplink input power density	-63.45 dBW/Hz	-63.45 dBW/Hz
Satellite downlink EIRP density	-18 dBW/Hz	-18 dBW/Hz
E/S Rx system noise temperature	315 K	315 K

In order to demonstrate compatibility with these two NGSO networks, a worst case, static interference analysis is performed. The smallest possible angle will occur when the GSO satellite, the NGSO satellite and the relevant earth station are all on the same longitude and the

4 *See* SAT-AMD-20040719-00138 and SAT-AMD-20040719-00141.

earth station is at a high latitude. Assuming a minimum 10° elevation angle for the GSO earth station, this sets the latitude to 71.4°N. The GESN and ATCONTACT satellites do not transmit when they are at an altitude below 16000 km, which translates to a latitude of 31.9°N. With this information, the smallest possible angular separation is then calculated to be 27.4 degrees. Both the transmitting GSO earth station (uplink calculation) and the victim NGSO earth station (downlink calculation) have been assumed to be at a latitude of 71.4°N.

Table 12-2 shows the results of interference calculations from the JUPITER 91W networks into the GESN and ATCONTACT networks and vice versa. The calculated $\Delta T/T$ values in all cases are very small, indicating the technical compatibility of the JUPITER 91W satellite network with the GESN and ATCONTACT networks.

The compatibility of these networks is largely due to the fact that the two NGSO networks do not communicate with earth stations when their satellites cross the equatorial plane, thus in-line events with a GSO network do not occur. For other types of NGSO constellations that do communicate with earth stations when the satellites pass through the equatorial plane, it is possible that an in-line interference event could occur. In order to protect such systems, Hughes will cease transmissions from the JUPITER 91W satellite and its associated earth stations such that the required amount of angular separation with the NGSO network is always maintained.

Table 12-2. Worst case interference calculations.

Victim network Interfering network		GESN / ATCONTACT JUPITER 91W	JUPITER 91W GESN / ATCONTACT
Uplink:			
Frequency band	GHz	29	29
Interfering uplink input power density	dBW/Hz	-56.9	-63.45
Angular separation	degrees	27.4	27.4
Slant range (Interfering path)	km	21046	40586
Space loss (Interfering path)	dB	208.2	213.9
Atmospheric & scintillation losses	dB	1.2	1.2
Victim satellite receive antenna gain	dBi	46.5	53
Victim satellite Rx system noise temperature	K	504	1259
No	dBW/Hz	-201.6	-197.6
Io	dBW/Hz	-226.7	-232.5
Io/No	dB	-25.2	-34.9
ΔT/T	%	0.3042	0.0324
Downlink:			
Frequency band	GHz	19	19
Interfering satellite downlink EIRP density	dBW/Hz	-17.0	-18
Slant range (Interfering path)	dB	40586	21046
Space loss (Interfering path)	dB	210.2	204.5
Atmospheric & scintillation losses	dB	1	1
Angular separation	degrees	27.4	27.4
Victim Rx earth station system noise temperature	K	315	225
No	dBW/Hz	-203.6	-205.1
Io	dBW/Hz	-235.2	-230.5
Io/No	dB	-31.5	-25.4
ΔT/T	%	0.0700	0.2880

A.12.2 Sharing with the O3b System

O3b proposes to communicate with a gateway earth station to be located in Hawaii using the 28.6-29.1 GHz and 18.8-19.3 GHz bands. The O3b constellation will use eight satellites in a medium earth orbit with an altitude of 8062 km and an inclination of zero degrees (i.e., an equatorial orbit). The satellites have steerable spot beams which are maintained on the gateway location as the satellites traverse their orbit, until a minimum elevation angle is no longer met. Table 12-3 shows the pertinent parameters of the JUPITER 91W network and the O3b system.

Table 12-3. Summary of JUPITER 91W and O3b parameters.

Parameters	JUPITER 91W	O3b System
Minimum Operational Elevation Angle		3°
Earth Station Uplink Input Power Density	-56.9 dBW/Hz	-53.4 dBW/Hz
Satellite Rx Antenna Gain	53 dBi	34.5 dBi
Satellite Rx System Noise Temp	1259 K	1000 K
Satellite Tx EIRP Density	-17 dBW/Hz	-28.32 dBW/Hz
Earth Station Rx System Noise Temperature	225 K	225 K

The minimum elevation angle for service to the Hawaiian gateway is stated as being 3 degrees. From this we can determine the eastern-most location of an O3b satellite, just before it can no longer communicate with the Hawaiian gateway, as being at 99.67° W.L. This orbital location provides the smallest angular separation with respect to the JUPITER 91W network. Any location of an O3b satellite further west will necessarily create a larger angular separation with respect to the JUPITER 91W network.

The O3b system has an equatorial orbit. From the perspective of sharing with a GSO network, this means that the location of a GSO network's transmitting earth station that causes the most interference to the O3b system would be a location closest to the equator, or in the case of the JUPITER 91W network, a gateway located the furthest south. Similarly, a GSO network's receiving ground antenna located closest to the equator would receive the most interference from the O3b system. Of course, in both cases, the location of the O3b ground antennas will also play a role in the mutual interference environment.

For interference calculation purposes, the locations of the JUPITER 91W gateway earth station and the subscriber antenna were chosen to be southern-most, or nearly so. For this particular interference situation, the JUPITER 91W antenna locations were also chosen to be towards the west it was found that this causes a higher mutual interference environment.

Given these antenna locations and with the O3b satellite assumed to be at 99.67° W.L., the angular separation (off-axis angle) at the relevant earth station can be calculated. In addition, the calculations take into account the fact that the JUPITER 91W satellite provides at least 20 dB of satellite antenna discrimination towards Hawaii in both uplink and downlink directions and the O3b satellites communicating with the Hawaiian gateway provide at least 20 dB of satellite antenna discrimination towards the service area of the JUPITER 91W satellite network in both uplink and downlink directions.

Table 12-4 shows the predicted interference degradations to the O3b system due to operation of the JUPITER 91W network and vice versa. The results show that the O3b system is adequately protected. The calculated $\Delta T/T$ values in all cases are extremely small, indicating the technical compatibility of the JUPITER 91W satellite network with the proposed operation of the O3b network.

The preceding demonstrates that the JUPITER 91W satellite network is compatible with O3b's proposed operations with a gateway earth station located in Hawaii. O3b's application states that O3b intends to seek authority to operate a second gateway, to be located somewhere within CONUS, at a future time. Hughes will take steps to ensure that any future O3b gateway located in CONUS will be properly protected.

Table 12-4. Interference calculations between JUPITER 91W and O3b (Hawaii).

Victim network		O3b (Hawaii)	JUPITER 91W
Interfering network		JUPITER 91W	O3b (Hawaii)
Uplink E/S Latitude	degrees	21.67	31.76
Uplink E/S Longitude	degrees	-158.03	-112.45
Downlink E/S Latitude	degrees	21.67	31.29
Downlink E/S Longitude	degrees	-158.03	-116.39
Uplink:			
Frequency band	GHz	28.85	28.85
Interfering uplink input power density	dBW/Hz	-56.9	-53.4
Angular separation between interfering E/S and victim satellite	degrees	15.43	10.45
Slant range (Interfering path)	km	9821	40302
Free space path loss (Interfering path)	dB	201.5	213.8
Atmospheric losses	dB	1.2	1.2
Victim satellite receive antenna gain	dBi	34.5	53
Victim Satellite's Antenna Discrimination towards Interfering E/S	dB	20	20
Victim satellite Rx system noise temperature	K	1000	1259
No	dBW/Hz	-198.6	-197.6
Io	dBW/Hz	-242.8	-228.8
Io/No	dB	-44.2	-31.2
ΔT/T	%	0.0038	0.0750
Downlink:			
Frequency band	GHz	19.05	19.05
Interfering satellite downlink EIRP density	dBW/Hz	-17.0	-28.32
Slant range (Interfering path)	dB	40302	9922
Free space path loss (Interfering path)	dB	210.1	198.0
Atmospheric & scintillation losses	dB	1	1
Angular separation between interfering satellite and victim E/S	degrees	10.45	14.67
Interfering Satellite's Antenna Discrimination towards Victim E/S	dB	20	20
Victim Rx earth station system noise temperature	K	225	225
No	dBW/Hz	-205.1	-205.1
Io	dBW/Hz	-241.6	-244.5
Io/No	dB	-36.5	-39.4
ΔT/T	%	0.0222	0.0115

A.13 PREDICTED RECEIVER AND TRANSMITTER CHANNEL FILTER RESPONSE CHARACTERISTICS

The Ka-band and V-band predicted receiver and transmitter frequency responses of the 250 MHz and 125 MHz channels, as measured between the receive antenna input and transmit antenna, fall within the limits shown in Table 13-1 below. In addition, the frequency tolerances of §25.202(e) and the out-of-band emission limits of §25.202(f) (1), (2) and (3) will be met.

Table 13-1: Predicted Channel Receiver and Transmitter Frequency Responses

Offset from Channel Center Frequency (MHz)	Receiver Filter Response (dB) 250 MHz Channel	Transmitter Filter Response (dB) 250 MHz Channel	Receiver Filter Response (dB) 125 MHz Channel	Transmitter Filter Response (dB) 125 MHz Channel
± 50			> -0.5	> -0.6
± 62.5			> -3.0	> -3.5
± 100	> -0.5	> -0.6		
± 125	> -3.0	> -3.5	< -30	< -25
±250	< -30	< -25		

A.14 SPACECRAFT CHARACTERISTICS

The spacecraft manufacturer for the JUPITER 91W satellite has not yet been selected. Hughes will provide the Commission with full and precise spacecraft physical characteristics when the satellite manufacturer has been selected and the satellite fully designed. Estimates of these characteristics are included in the Schedule S form.

The JUPITER 91W satellite will be designed for a 15 year life once on station. The probability of the entire satellite successfully operating throughout this period is estimated at 0.68 with the probability of the payload and bus being of 0.88 and 0.78, respectively. These numbers are based on documented failure rates of all critical components in the satellite bus and payload.

A.15 ORBITAL DEBRIS MITIGATION PLAN

Although the spacecraft manufacturer for the JUPITER 91W satellite has not yet been selected, Hughes will incorporate the objectives of Section 25.114(d)(14) into its satellite Technical Specifications, Statement of Work and Test Plans. The Statement of Work will include provisions to review orbital debris mitigation as part of the preliminary design review ("PDR") and the critical design review ("CDR") and to incorporate its requirements, as appropriate, into its Test Plan, including a formal Failure Mode Verification Analysis ("FMVA") for orbital debris mitigation involving particularly the TT&C, propulsion and energy systems. During this process, some changes to the Orbital Debris Mitigation Plan may occur and Hughes will provide the Commission with updated information, as appropriate.

A.15.1 Spacecraft Hardware Design

Hughes can confirm that the satellite will not undergo any planned release of debris during its operation. Furthermore, all separation and deployment mechanisms, and any other potential source of debris will be retained by the spacecraft or launch vehicle.

Although the JUPITER 91W satellite has not been completely designed, based on its experience, Hughes does not expect that the satellite will undergo any release of debris during its operation. Furthermore, all separation and deployment mechanisms, and any other potential source of debris will be retained by the spacecraft or launch vehicle.

In conjunction with the spacecraft manufacturer, Hughes will assess and limit the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. Hughes will take steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems.

Hughes will incorporate a rugged TT&C system with regard to meteoroids smaller than 1 cm through redundancy, shielding, and appropriate physical separation of components. The TT&C subsystem will have no single points of failure. The TT&C system will be equipped with near omni-directional antennas mounted on opposite sides of the spacecraft. These antennas, each providing greater than hemispherical coverage patterns, are extremely rugged and capable of providing adequate coverage even if struck, bent or otherwise damaged by a small or medium sized particle. Either one of the two omni-directional antennas, for both command and telemetry, will be sufficient to enable orbit raising. The command receivers and decoders and telemetry encoders and transmitters will be located within a shielded area and will be totally redundant and physically separated. A single rugged thruster and shielded propellant tank provide the energy for orbit-raising.

The propulsion subsystem will be designed such that it will not be separated from the spacecraft after de-orbit maneuvers. It will be protected from the effects of collisions with small debris through shielding. Moreover, propulsion subsystem components critical to disposal (e.g. propellant tanks) will be located deep inside the satellite, while other components, such as the thrusters, externally placed, are redundant to allow for de-orbit despite a collision with debris.

A.15.2 Minimizing Accidental Explosions

Once a spacecraft manufacturer has been selected, Hughes and the manufacturer will assess and limit the probability of accidental explosions during and after completion of mission operations. The satellite will be designed to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. The propulsion subsystem pressure vessels will be designed with high safety margins. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant lines and pressurization lines. All pressures, including those of the batteries, will be monitored by telemetry. At end-of-life and once the satellite has been placed into its final disposal orbit, Hughes will remove all stored energy from the spacecraft by depleting any residual fuel, leaving all fuel line valves open, venting the pressure vessels and the batteries will be left in a permanent state of discharge.

A.15.3 Safe Flight Profiles

In considering current and planned satellites that may have a station-keeping volume that overlaps the JUPITER 91W satellite, Hughes has reviewed the lists of FCC licensed satellite networks, as well as those that are currently under consideration by the FCC. In addition, non-USA networks for which a request for coordination has been published by the ITU within ±0.15° of 90.9° W.L. have also been reviewed.

The GALAXY-17 satellite operates at 91° W.L. and the NIMIQ-1 and NIMIQ-2 satellites operate at 91.1° W.L. All these satellites operate with an east-west station-keeping tolerance of ±0.05°.

There are no pending applications before the Commission to use an orbital location ±0.15° from 90.9° W.L and Hughes is not aware of any satellite with an overlapping station-keeping volume with the JUPITER 91W satellite that is the subject of an ITU filing that is either in orbit or progressing towards launch.

Based on the preceding, Hughes seeks to locate the JUPITER 91W satellite at 90.9° W.L. in order to eliminate the possibility of any station-keeping volume overlap with the GALAXY-17 satellite. Hughes therefore concludes that physical coordination of the JUPITER 91W satellite with another party is not required at the present time

A.15.4 Post-Mission Disposal

At the end of the operational life of the JUPITER 91W satellite, Hughes will maneuver the satellite to a disposal orbit with a minimum perigee of 300 km above the normal GSO operational orbit. The post-mission disposal orbit altitude is based on the following calculation, according to §25.283:

At the end of the operational life of the SPACEWAY 5 satellite, Hughes will maneuver the satellite to a disposal orbit with a minimum perigee of 300 km above the normal GSO operational orbit. The post-mission disposal orbit altitude is based on the following calculation, according to §25.283:

Total Solar Pressure Area "A" = 100 m^2
"M" = Dry Mass of Satellite = 3647 kg
"C_R" = Solar Pressure Radiation Coefficient = 1.3

Therefore the Minimum Disposal Orbit Perigee Altitude is calculated as:

= 36,021 km + 1000 x C_R x A/m

= 36,021 km + 1000 x 1.3 x 100/3647

= 36,056.6 km

= 271 km above GSO (35,786 km)

To provide adequate margin, the disposal orbit will be increased to 300 km. This will require approximately 16 kg of propellant, taking account of all fuel measurement uncertainties, which will be allocated and reserved in order to perform the final orbit raising maneuver.