Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
ECHOSTAR SATELLITE CORPORATION	)	
	)	File No. ________________
Applications for Authority to Construct, Launch And Operate Nine Geostationary Satellites in the Fixed-Satellite Service Using the Ka- and/or extended Ku- Bands at the 81°, 83°, 101°, 105°, 109°, 113°, 119°, 121° and 123° W.L. Orbital Locations	)	

APPLICATIONS

Pursuant to Section 308, 309 and 319 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 308, 309 and 319, Part 25 of the Commission's rules, 47 C.F.R. Part 25, and the Commission's recently released *First-Come-First-Served Report and Order* ("*FCFS Orde*r"),[1] EchoStar Satellite Corporation ("EchoStar") hereby files applications for authority to construct, launch and operate nine (9) geostationary ("GSO") satellites in the Fixed-Satellite Service ("FSS") using the Ka-band frequencies (including the portions of that band currently designated for GSO FSS and for non-geostationary ("NGSO") FSS) and the extended Ku-band frequencies (including the allotted and non-allotted portions of the extended Ku-band). EchoStar requests authority to use one or more of these frequency bands at the following orbital slots: 81°, 83°, 101°, 105°, 109°, 113°, 119°, 121° and 123° W.L. In accordance with the *FCFS Order*, the addition of these pending applications will *not* cause EchoStar to exceed the five-

[1] *In the Matter of Amendment of the Commission's Space Station Licensing Rules and Policies*, IB Docket No. 02-34, First Report and Order and Further Notice of Proposed Rulemaking, FCC 03-102 (rel. May 19, 2003) ("*FCFS Order*").

satellite limit for licensed-but-unbuilt and pending applications in each of these frequency bands.[2]

Specifically, EchoStar requests authority to launch and operate the following GSO FSS satellites:[3]

1. a satellite at 81° W.L. that would operate in the portion of the Ka-band designated for primary GSO FSS use – 18.3-18.8 GHz and 19.7-20.2 GHz from space-to-Earth, 28.35-28.6 GHz and 29.25-30.0 GHz from Earth-to-space;[4]

2. a satellite at 83° W.L. that would operate in the portion of the Ka-band previously designated for primary NGSO FSS use – the 18.8-19.3 GHz band from space-to-Earth and the 28.6-29.1 GHz band from Earth-to-space;[5]

3. a satellite at 101° W.L. that would operate in a portion of the allotted extended Ku-band – 10.70-10.75 GHz and 11.20-11.45 GHz from space-to-Earth, and 12.75-13.00 GHz and 13.15-13.20 GHz from Earth-to-space;[6]

4. a hybrid satellite at 105° W.L. with two payloads that would operate in the portion of the Ka-band previously designated for primary NGSO FSS use and the non-allotted extended Ku-band frequencies – 10.95-11.2 GHz and 11.45-11.7 GHz from space-to-Earth and 13.75-14.00 GHz from Earth-to-space;[7]

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[2] *See FCFS Order* at ¶¶ 230-231. In this regard, EchoStar notes that EchoStar 9, which includes a Ka-band payload, recently reached geostationary orbit and is now in operation.

[3] 47 C.F.R. § 25.114(a) states that each proposed space station must be submitted on FCC Form 312, but "[i]f an applicant is proposing more than one space station, information common to all space stations may be submitted in a consolidated system proposal."

[4] *See 28 GHz Order* at 22,326-27 ¶¶ 40-41, the *18 GHz Order* at 13,443-44 ¶¶ 28-29.

[5] *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, etc.*, Third Report and Order, 12 FCC Rcd 22,310 at 22,326-27 ¶¶ 40-41 (1997) ("*28 GHz Order*") and *Redesignation of the 17.7-19.7 GHz Frequency Band, etc.*, Report and Order, 15 FCC Rcd 13,430 at 13,443-44 ¶¶ 28-29 (2000) ("*18 GHz Order*").

[6] *See* Appendix 30B of the International Radio Regulations for ITU Region 2.

[7] *See Amendment of Part 2 of the Commission's Regulations to Conform, to the Extent Practicable, to the Geneva Radio Regulations, as Revised by the Space WARC, Geneva 1971*, Report and Order, 39 FCC 2d 959, 968 ¶ 41 (1973) and *Amendment of Parts 2, 25 and 90 of the Commission's Rules to Allocate the 13.75-14.0 GHz Band to the Fixed-Satellite Service*, Report and Order, 11 FCC Rcd 11,951 (1996).

5. a satellite at 109° W.L. that would operate in the non-allotted extended Ku-band frequencies;

6. a hybrid satellite at 113° W.L. with two payloads that would operate in the non-allotted extended Ku-band and the portion of the Ka-band previously designated for primary NGSO FSS use;

7. a hybrid satellite at 119° W.L. with two payloads that would operate in both the portion of the Ka-band designated for primary GSO FSS use and the portion previously designated for primary NGSO FSS use;

8. a satellite at 121° W.L. that would operate in the portion of the Ka-band previously designated for primary NGSO FSS use; and

9. a satellite at 123° W.L. that would operate in the portion of the Ka-band designated for primary GSO FSS use.

As the Commission is well aware, EchoStar is a leading provider of Direct Broadcast Satellite ("DBS") services in the multichannel video programming distribution ("MVPD") market with over 8 million subscribers. EchoStar and other EchoStar affiliates own and operate eight DBS satellites located at the 61.5° W.L., 110° W.L., 119° W.L. and 148° W.L. orbital locations. The proposed satellites will supplement and support EchoStar's existing MVPD offerings and will allow EchoStar to provide various kinds of two-way broadband services. These types of bundled offerings are needed in order for EchoStar to better compete in the MVPD marketplace.

All of the satellite applications being filed today satisfy the requirements of first-come-first-served processing under the *FCFS Order*, and EchoStar requests that they be placed in the appropriate position in the first-come, first-serve ("FCFS") queue based on their filing date and time. In particular, all of the frequency bands being requested, including the portions of the Ka-band domestically designated for primary NGSO FSS, are available because they are allocated internationally on a primary basis for the Fixed-Satellite Service.[8] EchoStar is also filing today a petition for rulemaking that proposes changes to the Ka-band plan and related domestic rule changes to accommodate co-primary GSO FSS operations in the designated NGSO FSS spectrum. The instant applications, however, are not predicated on any such rule changes, but rather request authority to operate on a non-harmful-interference basis. Therefore, consistent with the *FCFS Order*, the Commission should accept and grant promptly EchoStar's applications for authority to use this spectrum on a "non-conforming, non-harmful interference basis" and grant any necessary waivers of the rules without need to await the adoption of new service rules.[9] In any event, to the extent the Commission were to decide that some portions of these applications can be granted prior to others, it should treat independently each payload on the proposed hybrid satellites. Such independent treatment is also contemplated by the *FCFS Order*.[10]

I. GENERAL DESCRIPTION OF FSS SATELLITE SYSTEMS AND OPERATIONS

The proposed satellites will operate from the 81°, 83°, 101°, 105°, 109°, 113°, 119°, 121° and 123° W.L. orbital locations.

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[8] *FCFS Order* at ¶ 124 ("We will . . . consider applications filed after the ITU adopts an international frequency allocation but before the Commission adopts a domestic allocation.)

[9] *FCFS Order* at ¶ 124 ("We will consider such applications [i.e. where there is an ITU but no domestic allocation] only on a non-conforming, non-harmful interference basis to facilities operating consistent with the Table of Frequency Allocations."). *See also* Part VII, *infra*.

[10] *See FCFS Order* at ¶¶ 147-148 ("We will consider together both frequency band requests in a hybrid satellite application for purposes of the first-come, first-served procedure. Under this approach, when an applicant files a hybrid application, and that application reaches the head of the queue, we will grant it if the applicant is qualified, and granting authority to operate in that band would not conflict with any previously filed license. In cases where the applicant meets these standard for both requested frequency bands, we will authorize the requested hybrid satellite. In other cases, we may authorize the applicant to operate in only one of its requested frequency bands.").

The standalone Ka-band payloads in the primary GSO Ka-band spectrum will consist of 64 active transponders using eight 115 MHz channels across 1000 MHz of the GSO portion of the Ka-band spectrum in each direction (18.3-18.8 GHz and 19.7-20.2 GHz from space-to-Earth, and 28.35-28.6 GHz and 29.25-30 GHz from Earth-to-space). The standalone Ka-band payloads in the primary NGSO FSS spectrum will consist of 64 active transponders using four 115 MHz channels across 500 MHz of the NGSO portion of the Ka-band spectrum in each direction (18.8-19.3 GHz from space-to-Earth and 28.6-29.1 GHz from Earth-to-space). The hybrid satellites at 105° and 113° W.L that carry an extended Ku-band and a Ka-band payload in the primary NGSO FSS spectrum will have 56 Ka-band transponders instead of 64. The hybrid satellite at 119° W.L. with payloads in both the Ka-band GSO FSS spectrum and the Ka-band NGSO FSS spectrum will have 64 transponders using twelve 115 MHz channels across 1,500 MHz of the Ka-band spectrum in each direction. All of the Ka-band transponders will operate with multiple contiguous spot beams across North America on both uplink and downlink directions, in order to provide broadband two-way services to small user terminals.

The non-allotted extended Ku-band payloads will consist of 32 transponders each of 27 MHz usable bandwidth (with full frequency reuse) covering 500 MHz from space-to-Earth and 250 MHz from Earth-to-space (10.95-11.2 and 11.45-11.7 GHz from space-to-Earth, 13.75-14.00 GHz from Earth-to-space). The payload in the allotted portion of the extended Ku-band at 101° W.L. will consist of 18 transponders each of 27 MHz usable bandwidth covering 300 MHz in each direction (10.70-10.75 GHz and 11.20-11.45 GHz from space-to-Earth, and 12.75-13.00 GHz, 13.15-13.20 GHz from Earth-to-space).

The Technical Annex (*see* Exhibit 1) contains a detailed description of the technical specifications of the proposed satellite at the orbital location indicated therein and is incorporated into this narrative by reference. EchoStar also supplies, as Exhibit 2 to each application, all necessary Advance Publication, Appendix 30B, coordination and frequency assignment information (as applicable) for transmittal to the International Telecommunication Union ("ITU").

II. SERVICES TO BE PROVIDED

EchoStar will use the proposed satellites to provide primarily three types of services:

- Direct-to-Home services, including bandwidth-intensive "local-into-local" and High Definition services, to supplement the services provided today by EchoStar's DBS satellites and alleviate many of the spectrum constraints that have hampered its DBS offerings.
- Two-way broadband services, including interactive television and high-speed Internet access, to help EchoStar compete more effectively with its dominant competitors, cable operators, which increasingly bundle their traditional MVPD services with interactive offerings and high-speed Internet access.
- Transport of programming to EchoStar's DBS uplink centers, to serve its increasing needs for feeding programming to these centers.
- International Direct-to-Home, broadband and programming transport services.

EchoStar proposes to offer Direct-to-Home services, two-way broadband services, interactive services and HD content to consumers using transactions modeled on the current relationship between EchoStar and its DBS subscribers, which (as the Commission is aware) is a non-common carrier relationship, or other non-common carrier transactions.

III. FINANCIAL QUALIFICATIONS – COST OF CONSTRUCTION, LAUNCH AND OPERATION

The *FCFS Order* abolished the requirement of submitting an estimate of the proposed system's cost, as well as the financial qualification requirements.[11] Nonetheless, EchoStar is amply qualified to finance the construction, launch and operation of the proposed satellites.

IV. LEGAL QUALIFICATIONS

EchoStar's legal qualifications are a matter of record and are also set forth in the Form 312 submitted today for each satellite.

V. MILESTONES

EchoStar will submit itself to the milestones contemplated by the Commission's new rules for satellite licensees as set forth in the *FCFS Order*.[12]

VI. PUBLIC INTEREST CONSIDERATIONS

The grant of these applications clearly serves the public interest by allowing the provision of additional DTH services (including more local-into-local and High Definition ("HD") channels), two-way broadband, programming transport, and international services.

<u>DTH services.</u> The proposed satellites will help EchoStar become more competitive with cable operators in the MVPD market. Specifically, EchoStar has been laboring under the twin handicap of finite DBS spectrum and the lack of a "return" link that could enable

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[11] *FCFS Order* at ¶ 164, app.B §§ 6 and 13 (deleting §§ 25.114(c)(13), 25.140(b)(3)-(4) and 25.140(c)-(d)).

[12] *See FCFS Order* at ¶ 174 (contract execution within 1 year; Critical Design Review within 2 years; Commence Construction within 3 years; and Launch and Operate within 5 years).

truly interactive satellite services. Specifically, the DBS spectrum (up to 32 channels at each of a finite number of orbital locations) provides EchoStar with significantly less programming capacity than is available to digital cable systems. This limited spectrum must be used to provide local broadcast channels, national programming, HD content and interactive services across the entire United States. This spectrum constraint is exacerbated by the need to provide local broadcast channels by satellite to as many cities as possible and by the must-carry rules, as well as by consumer demand for more HD channels. In contrast, most cable systems can devote a full 750 MHz or more in each MSA to provide local, national and HD programming, as well as interactive and data services.[13] Even with spot beam satellites, the use of a DBS channel to provide local stations in one city generally reduces the spectrum available for DBS services elsewhere in the nation. Indeed, the need for more spectrum alternatives appears to grow more acute by the day as EchoStar attempts to provide local channels to an increasing number of MSA's and as more HD channels become available.

While the proposed satellites will not cure this spectrum shortage problem, it is imperative for EchoStar to deploy additional spectrum resources at orbital locations that can "view" the entire United States in order to lessen this widening competitive handicap.

Broadband. The proposed satellites will also help address spectrum and capacity constraints that have hampered the deployment of residential broadband services by satellite. The provision of satellite broadband service to a critical mass of consumers requires substantial satellite and spectrum resources. Unlike Direct-to-Home video, where some of the same spectrum can be used to provide services to many subscribers, broadband services require the dedication of bandwidth to each consumer receiving the service, meaning that a broadband

[13] *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, Ninth Annual Report, MB 02-145, FCC 02-338, at ¶ 23 tbl.3 (2002).

satellite can only serve a limited number of users. As explained in the EchoStar/Hughes merger proceeding:

> [e]ach kilobit of service used by a satellite broadband customer consumes a corresponding portion of frequencies on the transponder (typically 1.115 bits/Hertz), and therefore (in the case of a CONUS beam) prevents those same uplink and downlink frequencies from being simultaneously reused on the spacecraft anywhere else in CONUS. Thus, there are limits on the number of broadband users that can simultaneously receive broadband service on the same transponder.[14]

The combination of EchoStar's and Hughes' satellite resources would have alleviated this problem. But, now that the merger has been terminated, EchoStar must obtain authorizations for additional satellites with more transponders and frequencies if nationwide satellite broadband to residential consumers is to have any chance of becoming a reality. It is true that other obstacles, such as the lack of economies of scale needed to allow ubiquitous deployment of residential broadband services, must still be overcome. While there cannot be assurances in this regard, EchoStar believes that the additional capacity provided by the proposed satellites may be an important first step towards overcoming this obstacle as well.

The facilitation of broadband satellite service to consumers will have a two-fold public benefit. *First*, it will help extend the benefits of broadband service, increasingly a staple in urban areas, to all parts of the United States, including rural Americans that are today not reached by any terrestrial broadband offering. S*econd*, the grant of these applications will enable EchoStar to better compete with the bundled services offered over digital cable television systems. The importance of being able to offer a seamless bundle of video and broadband

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[14] EchoStar Communications Corporation et al.'s Opposition to Petitions to Deny and Reply Comments at attach.C ¶ 12 (Declaration of Mr. Arnold Friedman), *filed in Application of EchoStar Communications Corp., et al. for Authority to Transfer Control*, CS Docket No. 01-348 (filed Feb. 25, 2002) ("EchoStar/Hughes Opposition and Reply").

services cannot be overemphasized in considering what tools will be necessary to become and remain competitive with cable companies capable of leveraging their tremendous power in the MVPD marketplace into the broadband market. The Commission recognized years ago that "[m]ulti-service offerings and bundling services for sale seems to enhance subscription to alternative services offered by cable companies. . . . Indications are that consumers value receiving those services through 'one-stop-shopping.'"[15] Present-day, spectrum-constrained, satellite providers simply cannot offer a bundled video, broadband and interactive service comparable to that being rolled out by those cable companies offering digital cable service.[16]

Programming Transport. Grant of the applications will help better serve EchoStar's increasing need for the efficient transport of programming to its uplink centers, to the ultimate benefit of DBS consumers.

International Services. EchoStar proposes to use the proposed communications payloads for various types of international services. In particular, EchoStar's DBS business plan is increasingly focused on international programming.[17] The proposed satellites will help EchoStar provide to its customers many channels of international programming, including Latin American programming that is especially popular to U.S. consumers of Hispanic origin. Subject to the licensing requirements in a number of large Latin American countries as well as the applicable regulations regarding the size of earth stations in certain frequency bands, EchoStar is also interested in developing business plans for international DTH and broadband services to

[15] Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, CS Docket 98-102, FCC 98-335, at ¶ 60 (1998) ("Fifth MVPD Competition Report").

[16] *See also* EchoStar/Hughes Opposition and Reply at 82-83.

[17] *See* EchoStar Communications Corp., Press Release, *EchoStar's Dish Network to Launch up to 100 New International Satellite TV Channels This Summer* (Apr. 4, 2003).

consumers in those countries, starting with countries that have reached DTH/FSS bilateral agreements with the U.S.

VII. THE APPLICATIONS SATISFY THE REQUIREMENTS FOR FCFS PROCESSING

The Commission's *FCFS Order* explicitly provides that the Commission will consider applications under FCFS processing so long as the ITU has adopted a frequency allocation for the proposed service, even if the Commission has not yet adopted a domestic allocation.[18] All of the applications submitted by EchoStar satisfy this requirement because all of the frequency bands being requested in the proposed applications have primary FSS allocations, both domestically and internationally.

In particular, the portions of the Ka-band designated in the Commission's band plan for NGSO FSS use have a primary allocation for FSS in both the Earth-to-space and space-to-Earth directions under the international Radio Regulations, which allow co-primary operations by both GSO and NGSO systems. Until WRC-95, these bands were subject to Radio Regulation 2613, which made the NGSO systems effectively secondary – *i.e.* an NGSO system had to cease operations if it caused unacceptable interference into a GSO system. Resolution 118 at WRC-95 rendered Radio Regulation 2613 inapplicable to the 18.9-19.3 GHz and 28.7-29.1 GHz bands.[19] This rule was superseded by international Radio Regulation 5.523A. That footnote provides simply that, with the exception of certain grandfathered GSO networks, coordination by GSO and NGSO systems is subject to the usual coordination rules of Article 9 of the Radio

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[18] *FCFS Order* at ¶ 124 ("We will . . . consider applications filed after the ITU adopts an international frequency allocation but before the Commission adopts a domestic allocation.")

[19] *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, etc.*, First Report and Order, 11 FCC Rcd. 19,005 at 19,013-14 ¶ 23 n.18 (1996).

Regulations.[20] In other words, Radio Regulation 5.523A promoted NGSO systems to primary status without downgrading the primary status of GSO systems.

Indeed, the ITU has also promulgated sharing rules to allow for the co-primary operation of GSO and NGSO FSS systems in the adjacent portions of the Ka-band. At WRC-2000, the ITU finalized and adopted EPFD limits that "provide adequate protection to GSO systems without placing undue constraints on any of the systems and services sharing these frequency bands."[21]

It is only domestically that the Commission has designated the 28.6-29.1 GHz and the 18.8-19.3 GHz bands for primary or exclusive NGSO FSS use. In a Petition for Rulemaking being filed today, EchoStar is requesting that the Commission make certain rule changes – *e.g.*, remove the domestic restrictions on GSO FSS use of the bands and adopt the sharing criteria already established by the ITU in adjacent spectrum – that would facilitate the use of these bands by GSO FSS systems. As EchoStar explains in its Petition, the rationale articulated by the Commission for designating these bands for primary NGSO use in the first place has either disappeared or is outweighed by the public interest in the more efficient use of the spectrum.

Under the Commission's FCFS rules, however, the Commission should accept and grant the NGSO FSS portions of the instant applications without need to await adoption of these requested rule changes. The *FCFS Order* states specifically that, where, as here, there is an international allocation, the Commission will accept and process applications even in cases

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[20] *See* Table of International Allocations, 47 C.F.R. § 2.106, Note 5.523A ("The use of the bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) by geostationary and non-geostationary fixed-satellite service networks is subject to the application of the provisions of No. 9.11A . . . .").

[21] *See* WRC-2000, Resolution 76, *considering* clause (b).

where the Commission has not yet adopted service rules for a particular frequency allocation.[22] As the Commission explained in the *FCFS Order*, "we will require GSO-like satellite licensees to comply with applicable ITU requirements when we issue a license before we adopt frequency-band specific service rules."[23] The *FCFS Order* further explains that such applications can be granted if the requested operation is on a "non-conforming, non-harmful interference basis to facilities operating consistent with the Table of Frequency Allocations."[24]

In a different part of the *FCFS Order*, the Commission also stated: "on a going-forward basis, in cases where there are no service rules establishing criteria for sharing between GSO and NGSO satellite systems, we will consider only applications of the kind that is filed first."[25] This statement should not prevent acceptance of the NGSO FSS portions of the instant applications for three reasons.

First, as the *FCFS Order* explicitly states, this is a forward-looking policy ("on a going-forward basis") designed to resolve conflicts between applications filed *after* the effective date of the FCFS processing rules. As the Commission went on to explain:

> That is, if an NGSO-like satellite system application is filed first, we will conduct a processing round pursuant to the modified proceeding round procedure [adopted in the *FCFS Order*], and we will dismiss subsequently-filed GSO-like satellite system applications in that band until sharing criteria are established. Similarly, if a GSO-like satellite application system is filed first, we will consider other GSO-like satellite system applications in the order they are filed, and we will dismiss subsequently-filed NGSO-

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[22] *See FCFS Order* at ¶¶ 118-121.

[23] *FCFS Order* at ¶ 120 (footnote omitted).

[24] *See FCFS Order* at ¶ 124.

[25] FCFS Order at ¶ 58.

like satellite system applications in that band until sharing criteria are established.[26]

The International Bureau further confirmed the prospective nature of this policy in an Overview of the *FCFS Order* distributed at the July 8, 2003 public forum.[27] Thus, the pendency of certain NGSO applications filed *prior to* the effectiveness of the FCFS rules (indeed, many years ago) should not interfere with acceptance of the NGSO FSS portions of these applications.[28]

Second, even if the Commission intended to apply this policy retrospectively, it certainly would not apply where a GSO applicant seeks to operate in an NGSO band on a non-harmful-interference basis: in such a case, the *FCFS Order* has addressed the implications of the absence of service rules and has made it explicitly clear that the absence of such rules will not

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[26] *FCFS Order* at ¶ 58.

[27] *See* "Overview of First Space Station Reform Order," distributed by International Bureau staff at the FCC's Public Forum on First Space Station Reform Order (July 8, 2003), at 1 ("If the first application in this band is GSO-like, the Commission will consider only GSO-like applications in that band unless and until the Commission adopts criteria for sharing with NGSO-like systems, and vice versa.").

[28] The only company to be granted an NGSO FSS license to use these bands, Teledesic LLC, recently surrendered its license. *See* Letter from Mark A. Grannis, Counsel to Teledesic LLC, to Marlene H. Dortch, Secretary, FCC (dated June 27, 2003) (surrendering Teledesic's license to provide service in the bands using a constellation of NGSO satellites, requesting dismissal of a pending application to modify its licensed constellation, and noting that Teledesic has no objection to the suppression of all ITU filings for its proposed system). Only three of the original six second round applications for this spectrum remain pending – those of Skybridge II, LLC, @contact, LLC, and Northrop Grumman. Especially given the difficult financial climate for new satellite ventures, it is unclear whether the remaining three applicants will actually be able to go through with implementation of their proposed NGSO systems. *See, e.g.*, Matthew Secker, "What's Happened to Skybridge?" Telecommunications (International Edition) (July 1, 2002) (quoting a Skybridge vice president as stating "'By early . . . [2001], we had finished all the design work for the constellation. But by that time, there wasn't really any funding to take it to the next stage of development. Because of this, we had to put it on hold until such time that there would be.'").

bar acceptance of an application.[29] Indeed, if the sharing rule policy were interpreted as barring acceptance of the NGSO portions of these applications, there would be an irreconcilable conflict between that policy and the later pronouncements in the *FCFS Order* regarding the acceptance of applications without service rules: Paragraph 58 would be saying one thing (that the application should not be accepted because service rules have not been established) and Paragraphs 117-121 would be saying the opposite (that the application should be accepted even though service rules have not been established). The Commission cannot have intended such a conflict.

Third, precisely because EchoStar is proposing to operate its FSS payloads in the NGSO portions of the Ka-band on a non-harmful interference basis, exactly as contemplated in the *FCFS Order*,[30] the need for sharing criteria that appears to be the focus of this policy does not even arise. While EchoStar is today also requesting by a separate petition the establishment of sharing criteria to allow co-primary GSO and NGSO operations in the 18.8-19.3 and 28.6-29.1 GHz bands, this application requests something altogether different – operation of the FSS payloads in the NGSO portions of the Ka-band on a non-harmful-interference basis.[31] In these circumstances, EchoStar does not need any sharing criteria, and can make a very straightforward showing that such operation is possible. Specifically, in the unlikely event that one of the currently proposed NGSO systems becomes operational in compliance with its milestones, EchoStar will immediately cease operations upon notification of a concrete risk of harmful

[29] *See FCFS Order* at ¶ 118 (explaining that the Commission "will be able to act on applications as they are filed and therefore need not consider further the issue of holding applications in abeyance pending final service rules," because the Commission has adopted default service rules that will be applied in cases where service rules have yet to be finalized).

[30] *See FCFS Order,* at ¶ 58.

[31] Specifically, the request is for secondary operations consistent with the Table of Frequency Allocations for the uplinks and for operations on a non-conforming, non-harmful-interference basis under a waiver of a footnote to the Table for the downlinks.

interference by that system operator or by the Commission. Of course, EchoStar reserves the right to resume or continue operations if the Commission adopts GSO/NGSO sharing rules for these bands.

VIII. WAIVER REQUESTS

EchoStar hereby requests all necessary waivers of Section 2.106 of the Commission's Rules in order to allow it to operate its GSO satellites on a non-conforming use basis on those frequency bands that have not already been allocated or designated domestically for primary GSO FSS.

Specifically, for satellites that will operate in the portion of the Ka-band designated for primary NGSO FSS use, EchoStar requests waiver of Note NG 165 in the domestic Table of Allocations.[32] There is good cause for this waiver, as it would increase the likelihood that the spectrum in question will be put to productive use, to the benefit of consumers.[33] In particular, this spectrum is currently unused and is likely to remain fallow for the foreseeable future. As noted above, the only company with a license to use these bands, Teledesic,[34] recently informed the Commission that it was surrendering its license and dismissing

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[32] 47 C.F.R. § 2.106 Note NG 165. EchoStar does not believe that it needs a waiver of NG 104 for the extended Ku-band frequencies since all of its proposed satellites should qualify as "international systems."

[33] *See WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969) (Commission may waive a rule for good cause shown).

[34] *See In the Matter of Teledesic LLC*, 16 FCC Rcd. 2501 (2001). While there are three remaining second round applicants seeking NGSO Ka-band authorizations, NGSO FSS service in the Ka-band is unlikely to be deployed any time soon. For instance, Skybridge filed an NGSO license application in the second Ka-band processing round but reports indicate that it too has delayed its NGSO system due to market conditions. *Alcatel Postpones Skybridge Networks Project*, SATNEWS WEEKLY, Jan. 5, 2002, http://www.satnews.com/stories2/1jan2002-1.html.

its pending application to modify its licensed NGSO constellation.[35] Thus, it is extremely unlikely that anyone will be deploying an NGSO system in the Ka-band spectrum any time soon. The Commission must take steps to encourage the prompt use of this spectrum as part of its acknowledged duty to promote the efficient use of this scarce public resource.[36] While the Commission, in recognition of this duty, has begun to examine a number of options that may be taken to promote spectrum efficiency, including changes in spectrum allocations,[37] the simplest step it can take is to broaden the possible uses under existing allocations. For all of these reasons, there is good cause to waive Note NG 165 in the domestic Table of Allocations.

EchoStar also reserves the right to amend this application and request a modification of any license for extended Ku-band operations to the extent the Commission relaxes its restrictions on the size of antennas in these bands.[38] As the Commission is aware, as a result of decisions taken at the 2003 World Radiocommunications Conference, the size of antenna diameters have been reduced to as low as 1.2 meters, subject to various conditions and limitations.

In addition, EchoStar requests a waiver of 47 C.F.R. § 25.210(e) to the extent required to permit operation of the proposed extended Ku-band payloads by way of circular

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[35] *See* note 29, *supra*.

[36] The Commission's 1999 Policy Statement states in that regard: "[w]ith increased demand for a finite supply of spectrum, the Commission's spectrum management activities must focus on allowing spectrum markets to become more efficient and increasing the amount of spectrum available for use." *In the Matter of Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium*, 14 FCC Rcd. 19868 (1999), at ¶ 2.

[37] *See id.* at ¶ 15 (describing some of the Commission's significant reallocation efforts, such as the reallocation of spectrum in the 2 GHz region).

[38] *See* 47 C.F.R. § 25.204(f).

polarization.[39] There is good cause for this requested waiver. In the extended Ku-band, circular polarization is more efficient because it minimizes the installation cost for the small consumer premises receive-only earth stations, which are expected to be deployed in large numbers. The use of linear polarization would require additional adjustment capability on the earth station antenna mounts and additional setup procedures for the installer to ensure correct rotational alignment of the earth station feeds. These factors would translate to higher costs to the subscribers and increased risk of rotational misalignment, and hence unwanted interference, throughout the lifetime of the earth station.[40] The use of circular polarization will avoid these costs. Moreover, all of EchoStar's existing DBS operations use circular polarization for both the uplinks and downlinks, and use of circular polarization for the proposed extended Ku-band payloads would therefore be beneficial for EchoStar.

The foregoing benefits will not be accompanied by any detriment. The use of circular polarization in the extended Ku-band will not give rise to any increased interference to or from adjacent satellite networks that might be using linear polarization. The predominant use of digital modulation schemes, with their almost flat signal spectra, means that the aggregate interference from both polarizations in the adjacent satellite is essentially independent of the

[39] In fact, the polarization of the extended Ku-band payloads is fully switchable between linear and circular, and therefore the proposed satellite can comply with 47 C.F.R. § 25.210(e) even if the requested waiver were not to be granted.

[40] For these reasons, circular polarization has become a component of state-of-the-art satellite design for the Ku-band. *See*, *e.g.*, Public Notice, Report No. SAT-00137 (rel. Feb. 24, 2003) (SES Americom, Inc. requesting any necessary waiver to permit circular polarization in the Ku-band for the AMC-15 satellite).

types of polarization used in adjacent satellites. This matter has been studied extensively in the ITU Working Party 4A.[41]

Finally, the use of circular polarization in the extended Ku-band will ensure the same high level of frequency re-use as if linear polarization were used.[42]

IX. COMPLIANCE WITH COMMISSION RULES

The proposed satellites are all compatible with two-degree spacing rules in all non-allotted bands, and will not cause harmful interference to any authorized user of the spectrum. They also comply with all technical and non-technical requirements of Part 25 of the Rules, as amended by the *FCFS Order*. Specifically, EchoStar will comply with all applicable power flux density limits[43] and with the Commission's full frequency reuse requirements.[44]

Except where any waivers have been requested, EchoStar commits to comply with the Commission's Rules for GSO FSS satellites operating in the Ku- and Ka-bands.[45] Thus, in the portions of the Ka-band designated for primary NGSO FSS use, to the extent the Ka-band service rules for GSO satellites are not already applicable, EchoStar will comply with the default

[41] *See* the Chairman's Report of Working Party 4A meetings held in September 2000 and April 2001, based in part on US contributions.

[42] *See PanAmSat Licensee Corp.*, *Report and Order*, SAT-LOA-20011221-00134, SAT-WAV-20020322-00031 (rel. May 8, 2002) ("We find that granting PanAmSat's waiver request [to use circular polarization for certain transponders] would not undermine our policy. PanAmSat represents that its transponders will achieve full frequency reuse.")

[43] *See* 47 C.F.R. §§ 25.208(b) (for non-allotted extended Ku-band), 25.208(c)-(d) (for GSO FSS downlink Ka-band frequencies), 25.208(e) (for NGSO FSS Ka-band downlink frequencies).

[44] *See* 47 C.F.R. §§ 25.210(g).

[45] *See* 47 C.F.R. 25.145.

service rules established in the *FCFS Order*.[46] EchoStar will also comply with the default service rules for operations in the extended Ku-band. Once the Commission adopts frequency band-specific service rules, EchoStar will of course come into compliance with those rules in accordance with § 25.217(e) of the Commission's Rules.[47]

EchoStar acknowledges that there are other authorized services in the spectrum that it seeks. For instance, there are authorized terrestrial fixed service licensees in the 12.75-13.25 GHz band, including those that use this spectrum for cable television relay service ("CARS") and Television Auxiliary Broadcast Stations ("BAS") in many areas. GSO FSS satellite uplinks should not pose any interference problems in those areas where such terrestrial usage is sparse. In other areas, it may only be possible to operate a limited number of earth station terminals. In any event, EchoStar expects that it will be possible to coordinate FSS uplink operations with terrestrial CARS and BAS users, as such users are generally not permitted to point their directional transmitting antennas within 1.5 degrees of the geostationary arc.[48] EchoStar also expects that in the extended Ku-band downlink spectrum its receive terminals can co-exist in the interference environment in most geographic areas while maintaining an acceptable quality of service. As to government users of this spectrum, EchoStar will also provide the Commission with all necessary information required for coordinating its satellite operations in shared government/non-government frequency bands with the National Telecommunications and Information Administration ("NTIA").[49]

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[46] *See* 47 C.F.R. § 25.217(c).

[47] 47 C.F.R. § 25.217(e).

[48] *See* 47 C.F.R. §§ 74.643(b), 78.106(b).

[49] *See* 47 C.F.R. §§ 25.217(c)(2), 25.142(b)(2)(ii).

X. ORBITAL DEBRIS MITIGATION

Pursuant to 47 C.F.R. 2.217(d), applicants requesting a satellite authorization must submit a narrative statement describing the debris mitigation design and operational strategies, if any, that they will use.

To control orbital debris, EchoStar will use a design for its satellites and launch vehicles that minimizes the amount of debris released during normal operations. To ensure that the EchoStar satellites do not become a source of orbital debris, EchoStar will conduct an analysis to ensure that the probability of collision with any known space borne objects during its normal operational lifetime is minimal. EchoStar will also conduct an analysis that demonstrates that no realistic failure modes exist or can lead to an accidental explosion during normal operations or before completion of post operations disposal. At the end of the operational life of each satellite, EchoStar will maneuver its spacecraft to a storage orbit with a perigee altitude above its normal operational orbit. EchoStar will use a maneuver strategy that reduces the risk of leaving any of its spacecraft near an operational orbit regime. After each spacecraft has reached its final disposal orbit, all on-board sources of stored energy will be depleted or safely secured.

XI. ITU COST RECOVERY

EchoStar is aware that as a result of the actions taken at the 1998 Plenipotentiary Conference, as modified by the International Telecommunication Union ("ITU") Council in June 2001, processing fees will now be charged by the ITU for satellite network filings. As a consequence, Commission applicants are responsible for any and all fees charged by the ITU. EchoStar hereby states that it is aware of and unconditionally accepts this requirement and its responsibility to pay any ITU cost recovery fees for the ITU filings associated with this application. Invoices for such fees may be sent to the contact representative listed in the accompanying Form 312.

XII. CONCLUSION

For the foregoing reasons, EchoStar respectfully requests that the Commission promptly approve these applications as in the public interest, convenience and necessity.

Respectfully submitted,

EchoStar Satellite Corporation

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Exhibit 1

TECHNICAL ANNEX

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 pleading, that I am familiar with Part 25 of the Commission's rules that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

______________/s/_______________
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ECHOSTAR-123W

ATTACHMENT A
TECHNICAL DESCRIPTION

A.1 GENERAL DESCRIPTION

The EchoStar-123W satellite will operate at the 123°W.L. orbital location to provide Ka-band international and domestic FSS ("Fixed Satellite Service") services to North America. The satellite will use the 18.3-18.8 GHz and 19.7-20.2 GHz downlink bands and 28.35-28.6 GHz and 29.25-30.0 GHz uplink bands.

Employing a high frequency reuse factor, the satellite will utilize 64 active transponders using eight 115 MHz channels across 1000 MHz of the Ka-band spectrum in each direction. The transponders will operate with multiple contiguous spot beams across North America on both uplink and downlink, in order to provide broadband two-way services to small user terminals.

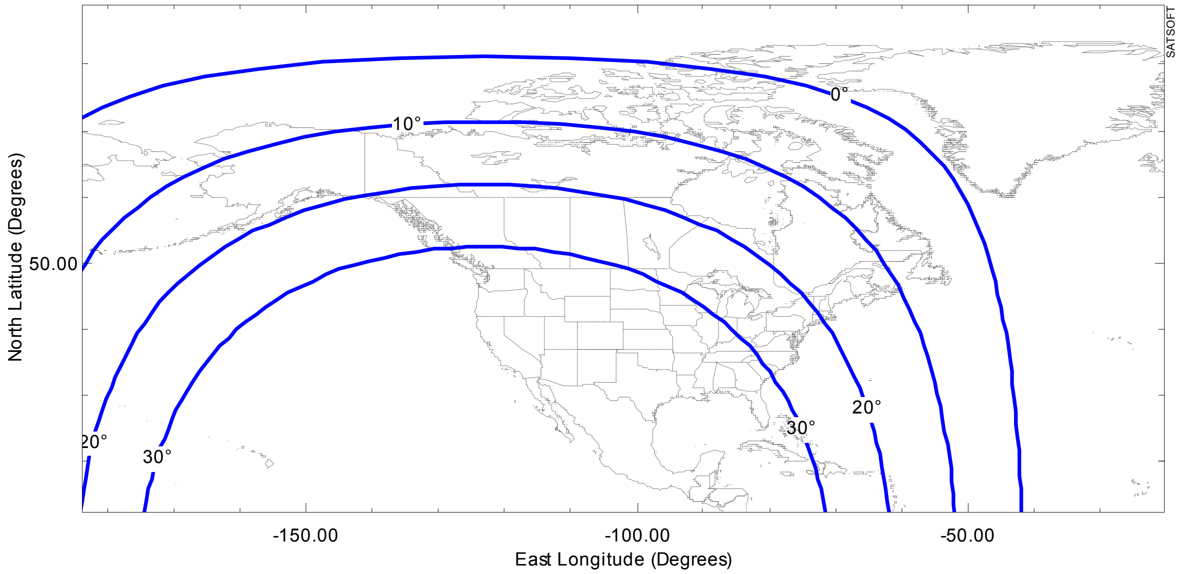
A.2 ORBITAL LOCATION

EchoStar requests Commission authority to use the 123°W.L. geostationary orbital location for the EchoStar-123W satellite. This available orbital location has been selected because, among other things, it provides high elevation angles to all of CONUS, which is very important for satellite services to large numbers of small and inexpensive consumer earth stations. The high elevation minimizes the risk of signal blockage due to buildings and foliage, and also minimizes the atmospheric and rain attenuation, a very important consideration for the Ka-band uplink and downlink frequencies.

Figure A.2-1 shows the elevation angles to the 123°W.L. orbital location from the service areas of the proposed EchoStar-123W satellite. Note that the majority of CONUS is above the 30° elevation angle. The only parts of the service areas that are below 30° are parts of North East

CONUS (where the elevation angle is still greater than 14°). Due to its westerly location, the 123°W.L. slot allows services to be provided to Alaska and Hawaii.

Figure A.2-1 – Elevation Angles to the 123°W.L. Orbital Location



A.3 SATELLITE COVERAGE

The EchoStar-123W satellite will provide two-way broadband services to small consumer terminals located in CONUS, Canada and Mexico. The Ka-band beam coverage is made up of multiple contiguous spot beams for both uplink and downlink. Sections A.5 and A.6 provide full details of the antenna beams used to provide the satellite coverage.

A.4 FREQUENCY AND POLARIZATION PLANS

The EchoStar-123W satellite Ka-band frequency plan is given in Table A.4-1, indicating channel center, upper and lower frequencies, as well as channel polarizations.

The channels are of nominal 115 MHz usable bandwidth, with a spacing between channel center frequencies of 125 MHz. Circular polarization is used on both the uplink and downlink with the downlink polarization being orthogonal to the uplink for each channel. There is no frequency offset between orthogonally polarized channels.

Table A.4-1 – Channel Frequency Plan for Ka-band

	UPLINK				DOWNLINK			
Txpdr #	Pol'n	Center Freq	F_{low}	F_{high}	Pol'n	Center Freq	F_{low}	F_{high}
Ka - 1	LHCP	29,312.50	29,255.00	29,370.00	RHCP	18,362.50	18,305.00	18,420.00
Ka - 2	RHCP	29,312.50	29,255.00	29,370.00	LHCP	18,362.50	18,305.00	18,420.00
Ka - 3	LHCP	29,437.50	29,380.00	29,495.00	RHCP	18,487.50	18,430.00	18,545.00
Ka - 4	RHCP	29,437.50	29,380.00	29,495.00	LHCP	18,487.50	18,430.00	18,545.00
Ka - 5	LHCP	28,412.50	28,355.00	28,470.00	RHCP	18,612.50	18,555.00	18,670.00
Ka - 6	RHCP	28,412.50	28,355.00	28,470.00	LHCP	18,612.50	18,555.00	18,670.00
Ka - 7	LHCP	28,537.50	28,480.00	28,595.00	RHCP	18,737.50	18,680.00	18,795.00
Ka - 8	RHCP	28,537.50	28,480.00	28,595.00	LHCP	18,737.50	18,680.00	18,795.00
Ka - 9	LHCP	29,562.50	29,505.00	29,620.00	RHCP	19,762.50	19,705.00	19,820.00
Ka - 10	RHCP	29,562.50	29,505.00	29,620.00	LHCP	19,762.50	19,705.00	19,820.00
Ka - 11	LHCP	29,687.50	29,630.00	29,745.00	RHCP	19,887.50	19,830.00	19,945.00
Ka - 12	RHCP	29,687.50	29,630.00	29,745.00	LHCP	19,887.50	19,830.00	19,945.00
Ka - 13	LHCP	29,812.50	29,755.00	29,870.00	RHCP	20,012.50	19,955.00	20,070.00
Ka - 14	RHCP	29,812.50	29,755.00	29,870.00	LHCP	20,012.50	19,955.00	20,070.00
Ka - 15	LHCP	29,937.50	29,880.00	29,995.00	RHCP	20,137.50	20,080.00	20,195.00
Ka - 16	RHCP	29,937.50	29,880.00	29,995.00	LHCP	20,137.50	20,080.00	20,195.00

Note that Table A.4-1 shows only 16 Ka-band channels (using both polarizations) although there are 64 Ka-band transponders. The satellite will employ a 4-frequency spatial re-use scheme such that any 115 MHz channel is re-used a minimum of 5 times by a combination of polarization and spatial frequency re-use. This more than meets the requirements for full frequency re-use of the spectrum as required by §25.210(d) of the Rules. The assignment of transponders to individual beams is explained in more detail in section A.21 below.

TT&C operations will take place in portions of the main service link frequency ranges of the satellite, as discussed in detail in Section A.19. Therefore exact frequency plans for the TT&C transmissions are not yet available.

A.5 SATELLITE TRANSMIT CAPABILITY

Figure A.5-1 shows the –3 dB contours of the 42 downlink spot beams used at Ka-band. The service area of each spot beam actually extends beyond the –3 dB contour and therefore provides service to those small parts of CONUS not contained within the –3 dB contour of the beams shown in Figure A.5-1. One of these beams is shown in detail in Figure A.5-2 in terms of its relative gain contours. All spot beams are nominally identical, and each has a peak antenna gain of 45.5 dBi.

Each Ka-band transponder will use one 125 Watt TWTA (21.0 dBW) dedicated to one downlink spot beam. The losses between the TWTA output and the antenna input amount to 2.0 dB. The resulting beam peak saturated EIRP level for these transponders will be 64.5 dBW (i.e., 45.5+21.0-2.0), and the saturated EIRP level at the –4 dB contour, which is typically the edge of coverage of the service area of each spot beam, will be 60.5 dBW.

The cross-polar isolation of the satellite transmit antennas will exceed 30 dB within the -4 dB gain contour at all transmit frequencies.

Figure A.5-1 – Ka-Band Downlink Beam Coverage – All Beams

(Contours shown are –3 dB relative to the beam peak)

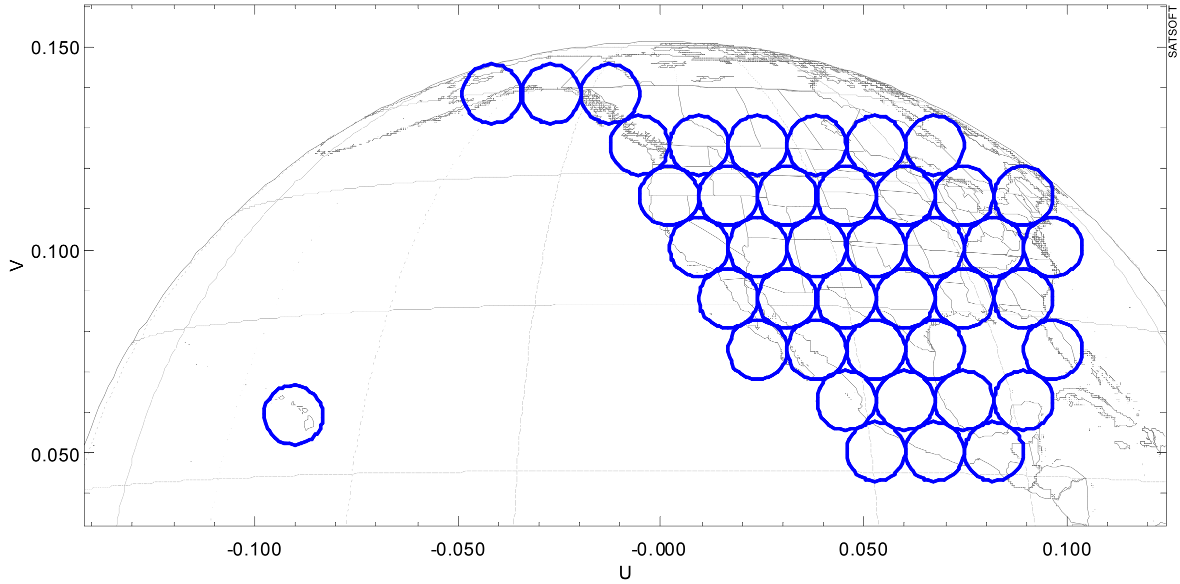
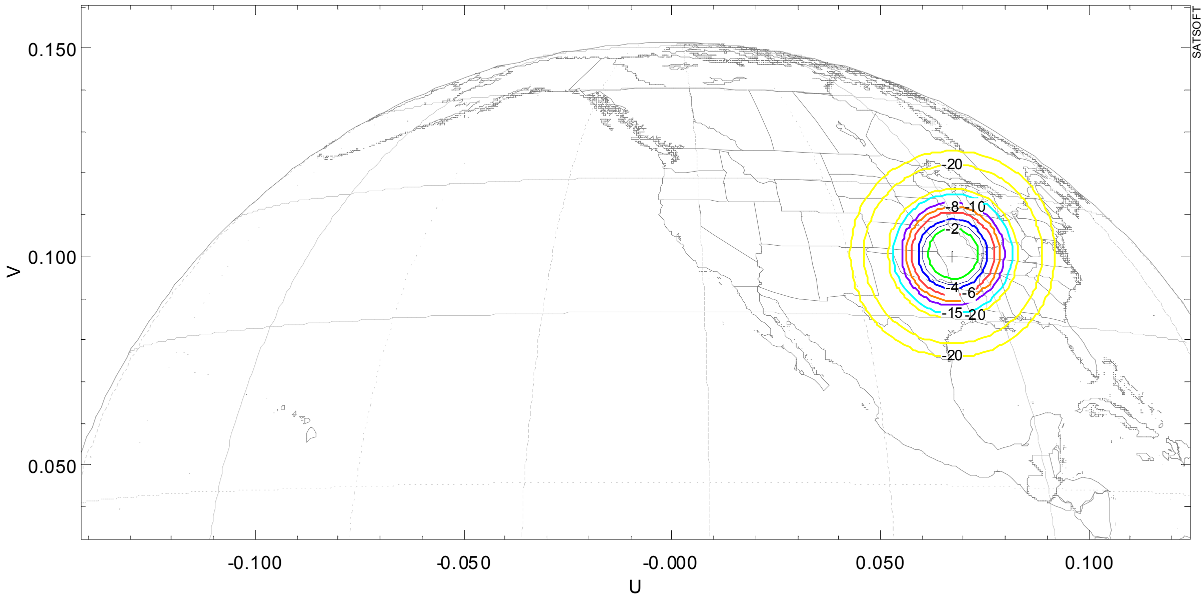


Figure A.5-2 – Ka-Band Downlink Beam Coverage – Sample Beam

(Contours shown are -2, -4, -6, -8, -10, -15, and -20 dB relative to the beam peak)



A.6 SATELLITE RECEIVE CAPABILITY

Figure A.6-1 shows the –3 dB contours of the 42 uplink spot beams used at Ka-band. One of these beams is shown in detail in Figure A.6-2 in terms of its relative gain contours. All spot beams are nominally identical, and each has a peak antenna gain of 45.5 dBi.

The satellite receive system noise temperature is 790 K (equivalent to 29.0 dB-K). Therefore the beam peak G/T performance is +16.5 dB/K (i.e., 45.5-29.0), and the performance at the –4 dB relative gain contour is +12.5 dB/K.

The cross-polar isolation of the satellite receive antennas will exceed 30 dB within the -4 dB gain contour at all transmit frequencies.

Figure A.6-1 – Ka-Band Uplink Beam Coverage – All Beams

(Contours shown are -3 dB relative to the beam peak)

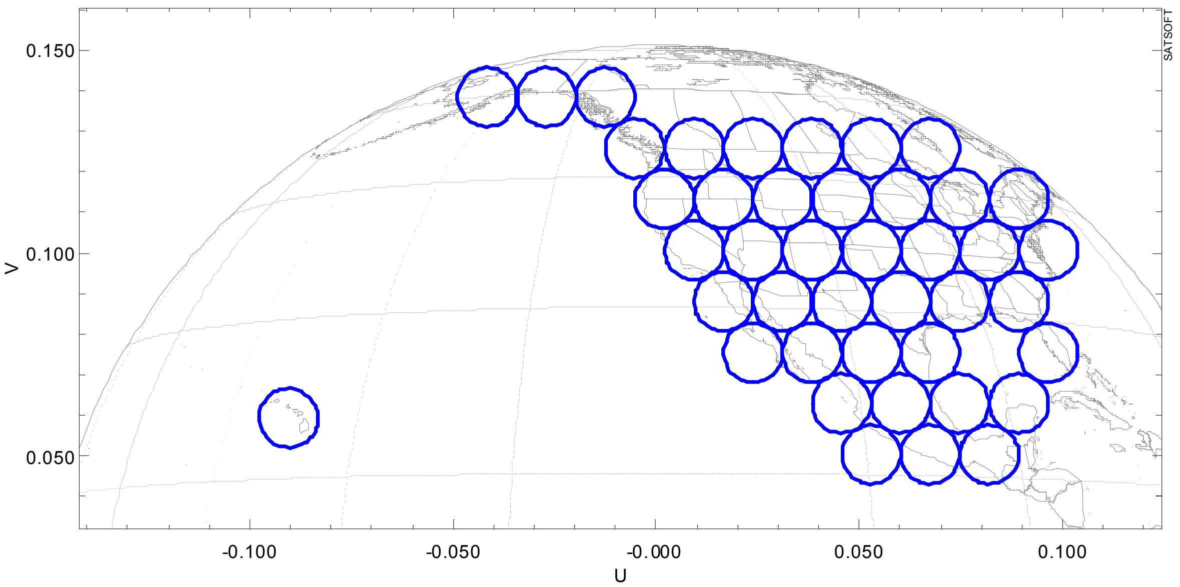
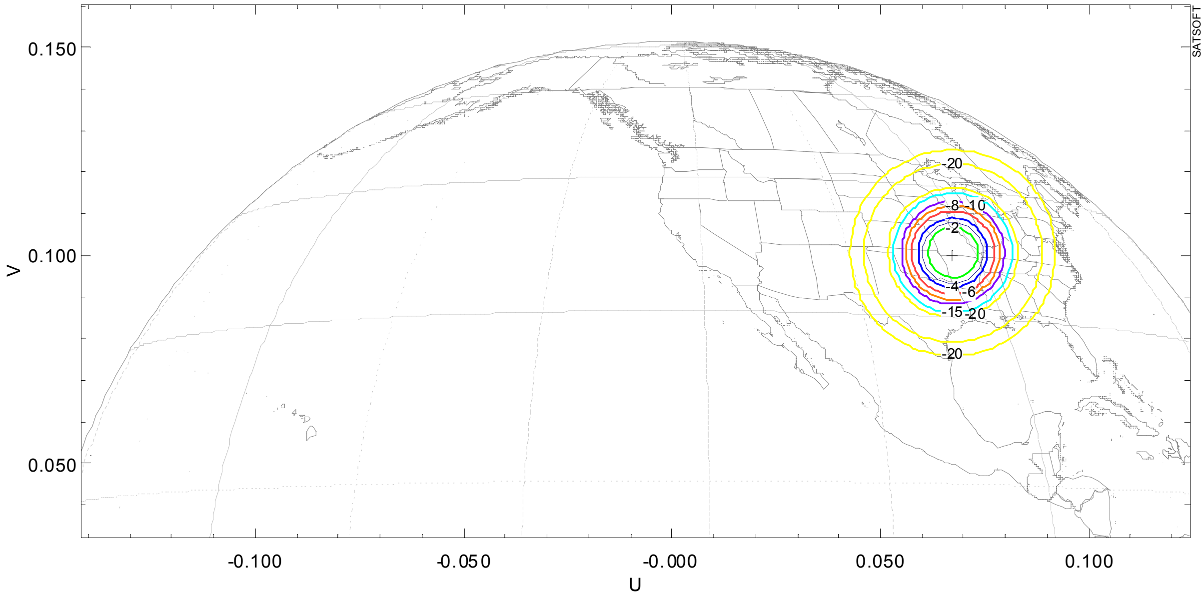


Figure A.6-2 – Ka-Band Uplink Beam Coverage – Sample Beam

(Contours shown are -2, -4, -6, -8, -10, -15, and -20 dB relative to the beam peak)



A.7 TRANSMISSION SCHEMES

In the uplink direction, Frequency Division Multiplex Access ("FDMA") is used. In the downlink direction, a single carrier comprised of Time Division Multiplexed ("TDM") information is transmitted to all users assigned to a particular channel. Uplink to downlink beam interconnectivity is achieved by the use of an on-board processor ("OBP").

For each uplink signal within the 115 MHz of uplink spectrum, the signal is demodulated and routed to the appropriate downlink beam where the baseband information is multiplexed with the other signals destined for the same downlink beam. This combined waveform is then modulated onto the 115 MHz TDM carrier. The use of OBP allows for different channel bandwidths and connectivities to be established at different times between uplink and downlink spot beams, making it flexible for changing or unpredictable traffic requirements.

A.8 TRANSPONDER GAIN CONTROL AND SATURATION FLUX DENSITY

The transponders will be operated in a fixed gain mode, with the actual gain being programmable for each transponder individually by ground command. The SFD will be adjustable in the range of -105 to -85 dBW/m^2 in 1 dB steps.

A.9 SATELLITE TRANSPONDER FILTER RESPONSE

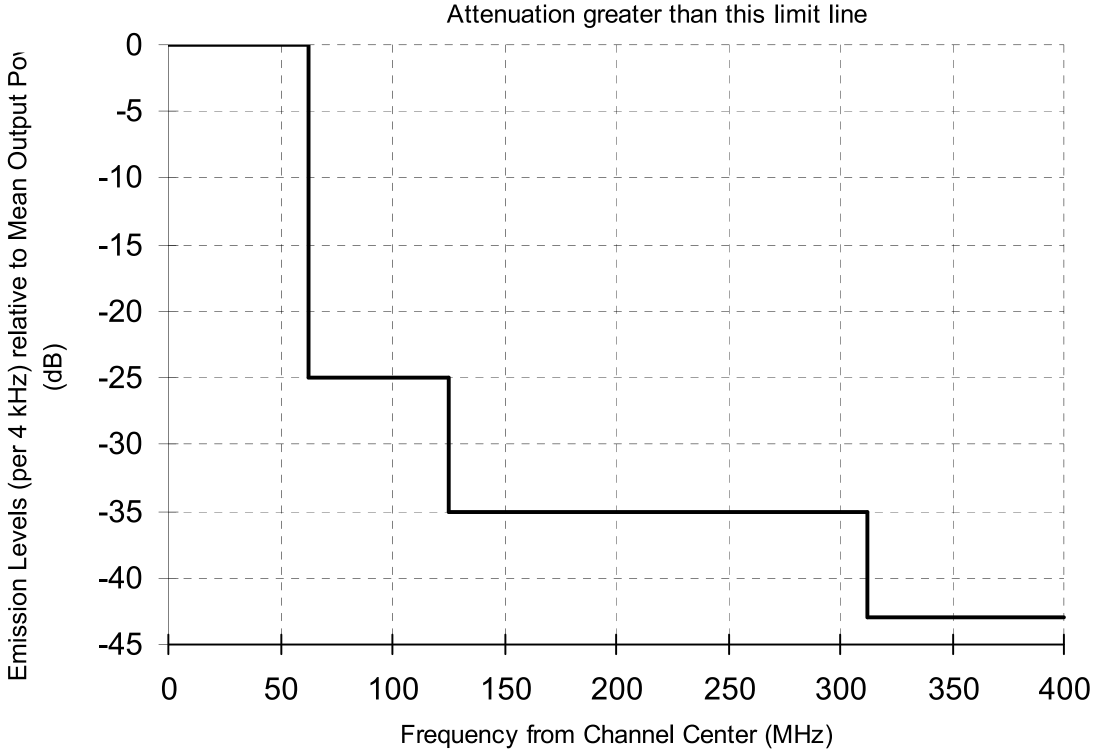
The specification for the overall transponder in-band filter response and out-of-band attenuation is dictated by the following considerations:

1. The in-band gain and group delay response must be flat enough so as not to degrade significantly the bit error rate performance of the digital carriers in the transponder;
2. The out-of-band attenuation must be high enough, in the adjacent transponder frequency band, to suppress adequately the multi-path transmission through adjacent transponders.
3. The out-of-band attenuation must also be sufficient to suppress any unwanted signals in frequency bands adjacent to the transponder frequency band, which could otherwise cause overload of the active amplifiers in the communications payload, or waste the available power of the TWTAs.

A.10 UNWANTED EMISSIONS

The out-of-band emissions will not exceed the mask given in Figure A.10-1 below.

Figure A.10-1 – Unwanted Emission Mask for Ka-Band Payload



A.11 EMISSION DESIGNATORS AND ALLOCATED BANDWIDTH OF EMISSION

The emission designators are listed below:

51K2G7W
102KG7W
500KG7W
2M00G7W
6M80G7W
115MG7W

For TT&C the emission designators will be as follows:

Telecommand (including ranging):	1M00F2D
Telemetry (including ranging):	1M00F2D

A.12 EARTH STATIONS

The primary subscriber Ka-band transmit/receive earth station to be used with the EchoStar-123W satellite will be a 65 cm antenna. Such terminals are expected to be deployed in large numbers across the service areas (several millions). In some areas and for certain applications, where higher clear-sky performance is required, larger antennas may be used (typically 90 cm, 120 cm, 150 cm or 180 cm).

In addition there will be a small number of medium and large gateway earth stations that are used for transporting signals back to the terrestrial networks, such as for Internet connections. These gateway stations will use an antenna in the range 3.7 meters to 11 meters, depending on the network requirements.

A.13 LINK BUDGETS

The EchoStar-123W satellite will support a variety of uplink data rates ranging from 64 kbps to high-speed. The supportable uplink date rate is dependent on the size of the subscriber's antenna, the rain zone, the link elevation angle and the location of the subscriber relative to the gain contour of the satellite's receive beam. Tables A.13-1 through A.13-3 show representative link budgets for different uplink data rates and antennas sizes. All link budgets assume the uplink location is within ITU-R Rain Zone "K", there is a 30 degree elevation angle towards the satellite and the uplink location lies on the -3 dB receive beam gain contour. Link availabilities are in excess of 99.6%

Table A.13-1 – Uplink Link Budget for 65 cm antenna (128 kbps)

Link Parameters		Clear Sky (- 3dB Contour)	Faded (-3 dB Contour)	
Link Geometry:				
Elevation Angle	(degrees)	30.0	30.0	
Tx E/S Range to Satellite	(km)	38,612	38,612	
Uplink:				
Carrier Frequency	(MHz)	29,800	29,800	
Data Rate	(kbps)	128	128	
Carrier Bandwidth	(kHz)	102	102	
Tx E/S Antenna Diameter	(m)	0.65	0.65	
Tx E/S Power to Antenna	(W)	0.1	0.4	
Tx E/S Antenna Gain	(dB)	43.9	43.9	
Tx E/S EIRP per Carrier	(dBW)	33.9	39.9	
Atmospheric and Other Losses	(dB)	0.7	8.0	99.6% availability
Free Space Loss	(dB)	213.7	213.7	
G/T towards Tx E/S	(dB/K)	13.5	13.5	
(Eb/No) - Thermal Uplink	(dB)	10.6	9.3	
(Eb/Io) - (Other Link Degradations)	(dB)	16.0	16.0	
(Eb/No+Io) - Total Actual	(dB)	9.5	8.5	
(Eb/No+Io) - Total Required	(dB)	7.0	7.0	
Excess Margin	(dB)	2.5	1.5	

Table A.13-2 – Uplink Link Budget for 65 cm antenna (2.5 Mbps)

Link Parameters		Clear Sky (- 3dB Contour)	Faded (-3 dB Contour)	
Link Geometry:				
Elevation Angle	(degrees)	30.0	30.0	
Tx E/S Range to Satellite	(km)	38,612	38,612	
Uplink:				
Carrier Frequency	(MHz)	29,800	29,800	
Data Rate	(kbps)	2,500	2,500	
Carrier Bandwidth	(kHz)	2,000	2,000	
Tx E/S Antenna Diameter	(m)	0.65	0.65	
Tx E/S Power to Antenna	(W)	2	6	
Tx E/S Antenna Gain	(dB)	43.9	43.9	
Tx E/S EIRP per Carrier	(dBW)	46.9	51.7	
Atmospheric and Other Losses	(dB)	0.7	8.0	99.6% availability
Free Space Loss	(dB)	213.7	213.7	
G/T towards Tx E/S	(dB/K)	13.5	13.5	
(Eb/No) - Thermal Uplink	(dB)	10.7	8.2	
(Eb/Io) - (Other Link Degradations)	(dB)	16.0	16.0	
(Eb/No+Io) - Total Actual	(dB)	9.6	7.5	
(Eb/No+Io) - Total Required	(dB)	7.0	7.0	
Excess Margin	(dB)	2.6	0.5	

Table A.13-3 – Uplink Link Budget for 1 m antenna (8.5 Mbps)

Link Parameters		Clear Sky (- 3dB Contour)	Faded (-3 dB Contour)	
Link Geometry:				
Elevation Angle	(degrees)	30.0	30.0	
Tx E/S Range to Satellite	(km)	38,612	38,612	
Uplink (per carrier):				
Carrier Frequency	(MHz)	29,800	29,800	
Data Rate	(kbps)	8,448	8,448	
Carrier Bandwidth	(kHz)	6,800	6,800	
Tx E/S Antenna Diameter	(m)	1.0	1.0	
Tx E/S Power to Antenna	(W)	3.0	9.0	
Tx E/S Antenna Gain	(dB)	47.7	47.7	
Tx E/S EIRP per Carrier	(dBW)	52.4	57.2	
Atmospheric and Other Losses	(dB)	0.7	8.0	99.6% availability
Free Space Loss	(dB)	213.7	213.7	
G/T towards Tx E/S	(dB/K)	13.5	13.5	
(Eb/No) - Thermal Uplink	(dB)	10.9	8.4	
(Eb/Io) - (Other Link Degradations)	(dB)	16.0	16.0	
(Eb/No+Io) - Total Actual	(dB)	9.7	7.7	
(Eb/No+Io) - Total Required	(dB)	7.0	7.0	
Excess Margin	(dB)	2.7	0.7	

Table A.13-4 shows a representative downlink link budget with a 65 cm antenna located at the -3 dB contour and in ITU-R Rain Zone "K". Link availability is in excess of 99.7%. Higher link availabilities can be attained through the use of larger receive antennas.

Table A.13-4 – Downlink Link Budget for 65 cm antenna (140 Mbps)

Link Parameters		Clear Sky (- 3dB Contour)	Faded (-3 dB Contour)	
Link Geometry:				
Elevation Angle	(degrees)	30.0	30.0	
Rx E/S Range to Satellite	(km)	38,612	38,612	
Downlink:				
Carrier Frequency	(MHz)	20,000	20,000	
Data Rate	(Mbps)	140	140	
Carrier Bandwidth	(MHz)	115	115	
Saturated EIRP	(dBW)	64.5	64.5	
EIRP per Carrier towards Rx E/S	(dBW)	61.5	61.5	
Atmospheric and Other Losses	(dB)	0.6	5.0	99.7% availability
Free Space Loss	(dB)	210.2	210.2	
Rx E/S Antenna Diameter	(m)	0.65	0.65	
Antenna Mis-pointing Error	(dB)	0.50	0.50	
Rx E/S Antenna Gain	(dB)	40.5	40.5	
Rx E/S G/T	(dB/K)	17.5	15.0	
System (LNA+Sky) Noise Temp.	(K)	200	354	
(Eb/No) - Thermal Downlink	(dB)	14.8	7.9	
(Eb/Io) - (Other Link Degradations)	(dB)	16.0	16.0	
(Eb/No+Io) - Total Actual	(dB)	12.3	7.3	
(Eb/No+Io) - Total Required	(dB)	7.0	7.0	
Excess Margin	(dB)	5.3	0.3	

A.14 STATION-KEEPING AND ANTENNA POINTING ACCURACY

The satellite orbital inclination and longitudinal drift will be maintained within ±0.05° of nominal. The antenna axis attitude will be maintained within ±0.12° of nominal during normal mode and ±0.15° of nominal during orbit maneuvers (i.e., station-keeping).

A.15 POWER FLUX DENSITY AT THE EARTH'S SURFACE

In the 18.3-18.8 GHz portion of Ka-band there are Power Flux Density ("PFD") limits in §25.208(c), 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.

Compliance with these limits is demonstrated below using a simple worst-case methodology.

The maximum saturated EIRP per transponder is 64.5 dBW. 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 –97.56 dBW/m^2 in the 115 MHz transponder usable bandwidth (i.e., 64.5–162.06). Allowing for the use of digital modulation with an almost flat spectrum, the corresponding maximum PFD at the Earth's surface measured in a 1 MHz band would not exceed –118.2 dBW/m^2. This is less than the PFD limit value (which is –115 dBW/m^2/MHz) that applies at the low elevation angles (5° and below).[1] Therefore compliance with this PFD limit is assured. In fact the margin relative to the PFD limit is actually much greater than this because, over much of the beam coverage the elevation angle is actually higher than 25°, at which the PFD limit is 10 dB higher (-105 dBW/m^2/MHz).

A.16 FREQUENCY TOLERANCE

The satellite local oscillator frequency stability will determine the accuracy of the frequency conversion between uplink and downlink transmissions. This frequency conversion error will not exceed ±5 in 10^6 under all circumstances.

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[1] It should be noted that the maximum PFD value is also below the value given in §25.138 (a)(6) for blanket licensing of small user terminals.

A.17 CESSATION OF EMISSIONS

Each satellite transponder can be individually turned on and off by ground telecommand, thereby causing cessation of emissions from the satellite, as required.

A.18 LAUNCH VEHICLES

The spacecraft are compatible with several commercially available launch vehicles. A decision on the actual launcher to be used has not yet been made.

A.19 TT&C

The TT&C frequencies will be within the Ka-bands. The final selection of TT&C frequencies within the band is partly dependent on the choice of spacecraft supplier, based on their preferred on-board TT&C equipment. It also depends on the availability of a global TT&C earth station network to support the Launch and Early Operations Phase ("LEOP") of the satellite mission. Therefore, EchoStar proposes to define the precise TT&C frequencies shortly after it selects the satellite manufacturer for the EchoStar-123W satellite. The selection of the frequencies will also need to take into account the coordination required with the neighboring satellites. At that time EchoStar will inform the Commission of its selected TT&C frequencies and request the necessary authorization.

Regardless of the exact TT&C frequencies used, the satellites will be configured to operate their TT&C functions through omni-directional spacecraft antennas during the LEOP, as well as in the event of a spacecraft emergency where attitude control might be disturbed. When operating correctly on-station the TT&C function will be switched to a high gain satellite antenna to permit lower power TT&C transmissions on both uplink and downlink.

Once the satellites are on-station EchoStar will use its existing Spacecraft Operations Center and TT&C earth station facilities to control the satellites.

A.20 SPACECRAFT CHARACTERISTICS

The spacecraft manufacturer for the EchoStar-123W satellite has not yet been selected, and EchoStar does not wish to show preference by providing any data specific to any one manufacturer in this application. The design of the satellite has been based around the expected characteristics of the 3-axis stabilized spacecraft available from the three major U.S. suppliers (Boeing, Lockheed Martin and Loral) in the time frame necessary for these satellites.

The communications payload of the EchoStar-123W satellite requires approximately 14 kW d.c. power. Total spacecraft power requirements are approximately 16 kW d.c. power which necessitates beginning of life solar array power production capability of approximately 17 kW. The communications payload mass (including antenna) will be approximately 650 kg which results in a total spacecraft dry mass of approximately 2400 kg. The total spacecraft launch mass is in the range 5400 to 5800 kg depending on launch vehicle selected. The satellite operational lifetime will be between 12 and 15 years.

The spacecraft reliability will be consistent with current manufacturing standards in place for the major suppliers of space hardware. Bus reliability will be greater than 0.8 with an overall spacecraft reliability of greater than 0.7. Transponder sparing will be consistent with documented failure rates which allow attaining the overall spacecraft reliability numbers listed above.

EchoStar will provide the Commission with full and precise spacecraft physical characteristics when the final supplier and product has been selected.

A.21 COMMUNICATIONS PAYLOAD

The Ka-band communications payload is designed around the use of 42 uplink and 42 downlink spot beams, interconnected using 64 active transponders, each of 115 MHz usable bandwidth and 125 Watts saturated output power. The signal received by each beam is separately amplified, filtered and downconverted and then input to the on-board processor (OBP).

The OBP is used to provide flexibility in the interconnection of traffic between uplink and downlink beams, and to allow the uplink and downlink access techniques to be optimized. On the uplink, FDMA is used, with various carrier bandwidths available in the range 64 kbps to 8.448 Mbps. This permits each transmitting earth station to be equipped with a suitably sized power amplifier to support the constant data rate it is designed for, rather than having to support high power, high data rate bursts that would be necessary in a TDMA uplink access scheme. Each of the uplink carriers received by a beam is digitally filtered and demodulated on board the satellite, and the resulting baseband bit stream is routed through to be eventually transmitted in the appropriate downlink beam. Various bit streams destined for the same downlink beam but received by different uplink beams are combined into a high-speed digital multiplex and then modulated onto a 115 MHz downlink carrier. There is one such downlink carrier transmitted through each TWTA, operating close to saturation.

The functions of the OBP are programmable by ground command, so that time-varying traffic requirements can be accommodated. Both packet-switched and circuit-switched traffic routing is under consideration at the present time. Regardless of the eventual routing technique the capacity and frequency re-use of the satellite are the same, as described below.

The 42 uplink and downlink beams (described in sections A.5 and A.6 above) are arranged such that a 4-frequency spatial re-use scheme may be applied. In such a scheme, no two adjacent beams operate at the same frequency, and the first time that a frequency can be re-used is in a beam removed by at least one beamwidth.

Each of the 42 beams is permanently allocated one of the 64 transponders. The remaining 23 transponders are then flexibly allocated to beams that are likely to have greater traffic requirements. Up to three transponders can be allocated to any one beam. The choice of channel frequencies and polarizations is made in such a way as to minimize the intra-system interference between the beams, optimizing the isolation available from both the polarization discrimination and the spatial separation between co-frequency beams.

The 115 MHz bandwidth signals at the output of the OBP are up-converted and amplified before being input to the 125 Watt Traveling Wave Tube Amplifiers (TWTA). The output of the TWTAs are combined (where more than one transponder is connected to a single downlink beam) and connected to the appropriate downlink beam.

A.22 INTERFERENCE ANALYSIS (ADJACENT GSO SATELLITES)

A.22.1 Downlink Interference to 65 cm Earth Stations

The downlink interference due to adjacent GSO satellites can be calculated by comparing the gain of the 65 cm receiving antenna at 2.2° off-axis (which is 29-25log(2.2) = 20.4 dBi) with the peak gain of the antenna (40.1 dBi). The difference between these two is 19.7 dB, and this can be related to the C/I (carrier-to-interference ratio) in the situation where the adjacent satellite EIRP is identical to that of the wanted satellite. This result is better than the ITU's single-entry C/I criteria (which is C/N+12.2 dB), and so is considered to be acceptable for this scenario of earth station size and orbital spacing.

In addition, section A.15 showed the maximum PFD that can be transmitted by the EchoStar-123W satellite is -118.2 $dBW/m^2/1$ MHz. This value is lower than the PFD value given in §25.138 (a)(6) of the Rules for blanket licensing of small user terminals.

A.22.2 Ka-Band Uplink Interference from 65 cm Earth Stations

Compliance with the FCC two-degree spacing policy is assured provided the off-axis EIRP density limits of §25.138 (a)(1) of the Rules are not exceeded. The Ka-band clear sky off-axis EIRP density limits are equivalent to a maximum uplink input power density of -56.5 dBW/Hz. Table A.22-1 compares the uplink input power densities derived from the uplink link budgets contained in Tables A.13-1 through A.13-3 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.

Table A.22-1 – Demonstration of Compliance with the Uplink Power limits of §25.138 (a)(1)

Uplink Antenna Size	Data Rate	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)
65 cm	128 kbps	-60.1	-56.5	3.6
65 cm	2.5 Mbps	-60.0	-56.5	3.5
100 cm	8.4 Mbps	-63.5	-56.5	7.0

A.23 SHARING ANALYSIS WITH OTHER SERVICES AND ALLOCATIONS

FS stations licensed to use spectrum within the 18.3-18.8 GHz band are protected by virtue of the GSO FSS PFD limits contained in §25.208(c) of the Rules. Section A.15 above demonstrates that the EchoStar-123W satellite does not exceed the PFD limits of §25.208(c) of the Rules.

Exhibit 2

INTERNATIONAL COORDINATION

RAPPORT / REPORT / INFORME

A	*A1a* Space station	USASAT-43I	*A1f* Notifying adm.	USA	*BR1* Date of receipt	10.06.2003	*BR20* IFIC no.
	BR6a/BR6b Id. no.	1				ADVP	E

B1a/B1b Beam designation ADVP | *B2* Emi-Rcp E | *B3a1/B3b1/B3b2a* Max. ant. gain

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BR7a/BR7b Group id. 1

C4a Class of station	EC	ED	EK
C4b Nature of service	CP	OT	OT

C6a Polarization type | *C6b* Polarization angle

C11a2 Service area | *C11a3* Service area diagram

A2a Date of bringing into use 10.06.2008 | *A3a* Op. agency | *A3b* Adm. resp. | *BR16* Value of type C8b

C1 Frequency Range			
From		To	
28.35	GHz	28.6	GHz

13C Remarks

BR7a/BR7b Group id. 2

C4a Class of station	EC	ER	EK
C4b Nature of service	CP	OT	OT

C6a Polarization type | *C6b* Polarization angle

C11a2 Service area | *C11a3* Service area diagram

A2a Date of bringing into use 10.06.2008 | *A3a* Op. agency | *A3b* Adm. resp. | *BR16* Value of type C8b

C1 Frequency Range			
From		To	
18.3	GHz	18.8	GHz

13C Remarks

BR7a/BR7b Group id. 3

C4a Class of station	EC	ED	EK
C4b Nature of service	CP	OT	OT

C6a Polarization type | *C6b* Polarization angle

C11a2 Service area | *C11a3* Service area diagram

A2a Date of bringing into use 10.06.2008 | *A3a* Op. agency | *A3b* Adm. resp. | *BR16* Value of type C8b

C1 Frequency Range			
From		To	
29.25	GHz	30	GHz

13C Remarks

BR7a/BR7b Group id. 4

C4a Class of station	EC	EK	ER
C4b Nature of service	CP	OT	OT

C6a Polarization type | *C6b* Polarization angle

C11a2 Service area | *C11a3* Service area diagram

RAPPORT / REPORT / INFORME

A	*A1a* Space station	USASAT-43I	*A1f* Notifying adm.	USA	*BR1* Date of receipt	10.06.2003	*BR20* IFIC no.	
BR6a/BR6b Id. no.	1						ADVP	E

A2a Date of bringing into use: 10.06.2008

A3a Op. agency:

A3b Adm. resp.:

BR16 Value of type C8b:

C1 Frequency Range			
From		To	
19.7	GHz	20.2	GHz

13C Remarks:

BR22 Administration remarks:

BR23 Radiocommunication Bureau comments: