

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

|   |   |                |
|---|---|----------------|
| In the Matter of                                | ) |                |
|   | ) |                |
| <b>ECHOSTAR SATELLITE CORPORATION</b>           | ) |                |
|   | ) | 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 Order*”),<sup>1</sup> 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-

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<sup>1</sup> *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.<sup>2</sup>

Specifically, EchoStar requests authority to launch and operate the following GSO FSS satellites:<sup>3</sup>

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;<sup>4</sup>
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;<sup>5</sup>
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;<sup>6</sup>
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;<sup>7</sup>

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<sup>2</sup> 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.

<sup>3</sup> 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.”

<sup>4</sup> See *28 GHz Order* at 22,326-27 ¶¶ 40-41, the *18 GHz Order* at 13,443-44 ¶¶ 28-29.

<sup>5</sup> 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*”).

<sup>6</sup> See Appendix 30B of the International Radio Regulations for ITU Region 2.

<sup>7</sup> 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.<sup>8</sup> 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.<sup>9</sup> 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*.<sup>10</sup>

## **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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<sup>8</sup> *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.")

<sup>9</sup> *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*.

<sup>10</sup> *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.<sup>11</sup> 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*.<sup>12</sup>

### **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.

**DTH services.** 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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<sup>11</sup> *FCFS Order* at ¶ 164, app.B §§ 6 and 13 (deleting §§ 25.114(c)(13), 25.140(b)(3)-(4) and 25.140(c)-(d)).

<sup>12</sup> 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.<sup>13</sup> 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

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<sup>13</sup> *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.<sup>14</sup>

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. *Second*, 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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<sup>14</sup> 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.’”<sup>15</sup> 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.<sup>16</sup>

**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.<sup>17</sup> 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

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<sup>15</sup> 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”).

<sup>16</sup> See also EchoStar/Hughes Opposition and Reply at 82-83.

<sup>17</sup> 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.<sup>18</sup> 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.<sup>19</sup> 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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<sup>18</sup> *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.”)

<sup>19</sup> 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.<sup>20</sup> 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.”<sup>21</sup>

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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<sup>20</sup> 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 . . .”).

<sup>21</sup> See WRC-2000, Resolution 76, *considering* clause (b).

where the Commission has not yet adopted service rules for a particular frequency allocation.<sup>22</sup> 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.”<sup>23</sup> 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.”<sup>24</sup>

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.”<sup>25</sup> 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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<sup>22</sup> See *FCFS Order* at ¶¶ 118-121.

<sup>23</sup> *FCFS Order* at ¶ 120 (footnote omitted).

<sup>24</sup> See *FCFS Order* at ¶ 124.

<sup>25</sup> *FCFS Order* at ¶ 58.

like satellite system applications in that band until sharing criteria are established.<sup>26</sup>

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.<sup>27</sup> 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.<sup>28</sup>

*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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<sup>26</sup> *FCFS Order* at ¶ 58.

<sup>27</sup> 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.”).

<sup>28</sup> 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.<sup>29</sup> 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*,<sup>30</sup> 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.<sup>31</sup> 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

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<sup>29</sup> 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).

<sup>30</sup> See *FCFS Order*, at ¶ 58.

<sup>31</sup> 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.<sup>32</sup> 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.<sup>33</sup> 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,<sup>34</sup> recently informed the Commission that it was surrendering its license and dismissing

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<sup>32</sup> 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."

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

<sup>34</sup> 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.<sup>35</sup> 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.<sup>36</sup> 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,<sup>37</sup> 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.<sup>38</sup> 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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<sup>35</sup> See note 29, *supra*.

<sup>36</sup> 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.

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

<sup>38</sup> See 47 C.F.R. § 25.204(f).

polarization.<sup>39</sup> 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.<sup>40</sup> 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

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<sup>39</sup> 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.

<sup>40</sup> 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.<sup>41</sup>

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.<sup>42</sup>

## **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<sup>43</sup> and with the Commission's full frequency reuse requirements.<sup>44</sup>

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.<sup>45</sup> 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

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<sup>41</sup> See the Chairman's Report of Working Party 4A meetings held in September 2000 and April 2001, based in part on US contributions.

<sup>42</sup> 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.")

<sup>43</sup> 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).

<sup>44</sup> See 47 C.F.R. §§ 25.210(g).

<sup>45</sup> See 47 C.F.R. 25.145.

service rules established in the *FCFS Order*.<sup>46</sup> 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.<sup>47</sup>

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.<sup>48</sup> 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").<sup>49</sup>

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<sup>46</sup> See 47 C.F.R. § 25.217(c).

<sup>47</sup> 47 C.F.R. § 25.217(e).

<sup>48</sup> See 47 C.F.R. §§ 74.643(b), 78.106(b).

<sup>49</sup> 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.



**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/\_\_\_\_\_  
Richard Barnett  
Telecom Strategies Inc.  
6404 Highland Drive  
Chevy Chase, MD 20815  
(301) 656-8969



# **ECHOSTAR-101W**

## **EXHIBIT 1**

### **TECHNICAL DESCRIPTION**

#### **A.1 GENERAL DESCRIPTION**

The EchoStar-101W satellite will operate at the 101°W.L. orbital location to provide FSS (“Fixed Satellite Service”) services to North America. The satellite will use the 11.2-11.45 GHz band and a portion of the 10.7-10.75 GHz band for downlink transmissions and the 12.75-13.0 GHz band and a portion of the 13.15-13.2 GHz band for uplink transmissions (spectrum in the ITU Appendix 30B FSS allotment band).

There will be 18 transponders each of 27 MHz usable bandwidth, meaning full frequency reuse of up to 300 MHz of spectrum on both the uplink and downlink paths. There will be a variety of beam coverage areas and power levels available for each of these 18 transponders, switchable individually for each transponder by ground command. This flexibility ensures that the satellite can be operated consistent with the existing US allotments in Appendix 30B of the ITU Radio Regulations, and any subsequent modifications to those allotments as they are converted to more useful assignments through the Appendix 30B procedures of the ITU.

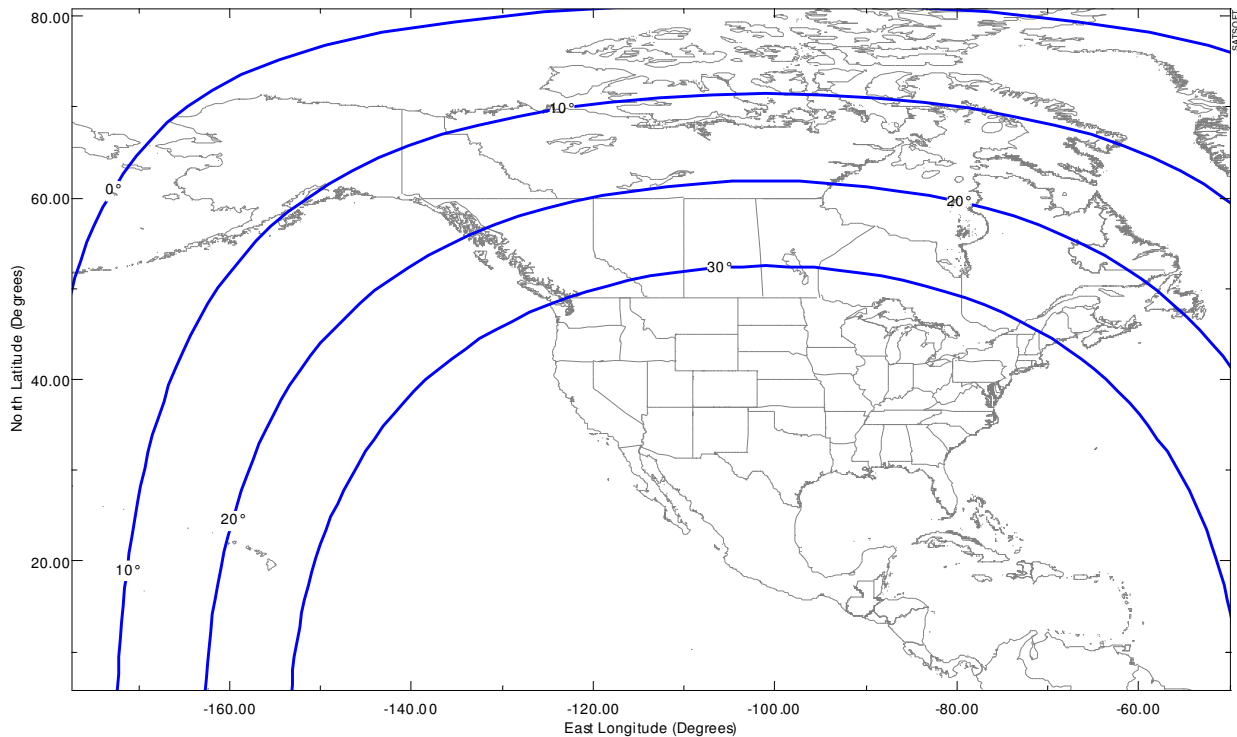
The EchoStar-101W satellite will primarily provide direct-to-home (“DTH”) satellite services to large numbers of small and inexpensive receive-only terminals in the service area. The uplinks to the satellite will primarily be large feeder-link type earth stations, although small transmit/receive terminals may be deployed subject to successful coordination with potentially affected administrations identified via the Appendix 30B modification procedures.

## A.2 ORBITAL LOCATION

EchoStar requests Commission authority to use the 101°W.L. geostationary orbital location for the EchoStar-101W satellite. This available orbital location has been selected because, among other things, it provides high elevation angles to all of North America, 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.

Figure A.2-1 shows the elevation angles to the 101°W.L. orbital location from the service areas of the proposed EchoStar-101W satellite. Note that the majority of CONUS is above the 30° elevation angle and the most populated portions of Canada are above the 20° elevation angle. The only part of CONUS that is below 30° elevation is the extreme North East, where the elevation angle is still greater than 27°. Service can also be provided on some beam configurations to both Hawaii and Alaska, as shown in Figure A.2-1.

**Figure A.2-1 – Elevation Angles to the 101°W.L. Orbital Location**



The 101°W orbital location has also been chosen because it has been allotted to the United States under the ITU's allotment plan contained in Appendix 30B of the Radio Regulations and governing the frequency bands proposed in this application..

### **A.3 SATELLITE COVERAGE**

Sections A.5 and A.6 provide full details of the antenna beams used to provide the satellite coverage areas. The beam coverage consists of several different downlink beams and a single CONUS uplink beam used primarily for the feeder links. These beam coverage areas will permit the EchoStar-101W satellite to initially provide one-way DTH satellite and other Fixed Satellite Services to CONUS, Alaska, Hawaii, Puerto Rico and the US Virgin Islands, as well as to other parts of North and Central America and the Caribbean, including Canada and Mexico.

### **A.4 FREQUENCY AND POLARIZATION PLANS**

The EchoStar-101W satellite frequency plan is given in Table A.4-1, indicating transponder center, upper and lower frequencies, as well as transponder polarizations.

The transponders are of nominal 27 MHz usable bandwidth, with a spacing between transponder center frequencies of 30 MHz. Both the uplink and the downlink polarizations are switchable between linear and circular. The cross-polar transponders are offset by 10 MHz relative to the co-polar ones in order to achieve additional isolation resulting from the guard bands.

Table A.4-1 - Transponder Frequency Plan

| Txpdr #  | UPLINK     |             |                  |                   | DOWNLINK   |             |                  |                   |
|----------|------------|-------------|------------------|-------------------|------------|-------------|------------------|-------------------|
|          | Pol'n      | Center Freq | F <sub>low</sub> | F <sub>high</sub> | Pol'n      | Center Freq | F <sub>low</sub> | F <sub>high</sub> |
| KuX - 1  | HP or LHCP | 12,765.00   | 12,751.50        | 12,778.50         | VP or RHCP | 11,215.00   | 11,201.50        | 11,228.50         |
| KuX - 2  | VP or RHCP | 12,775.00   | 12,761.50        | 12,788.50         | HP or LHCP | 11,225.00   | 11,211.50        | 11,238.50         |
| KuX - 3  | HP or LHCP | 12,795.00   | 12,781.50        | 12,808.50         | VP or RHCP | 11,245.00   | 11,231.50        | 11,258.50         |
| KuX - 4  | VP or RHCP | 12,805.00   | 12,791.50        | 12,818.50         | HP or LHCP | 11,255.00   | 11,241.50        | 11,268.50         |
| KuX - 5  | HP or LHCP | 12,825.00   | 12,811.50        | 12,838.50         | VP or RHCP | 11,275.00   | 11,261.50        | 11,288.50         |
| KuX - 6  | VP or RHCP | 12,835.00   | 12,821.50        | 12,848.50         | HP or LHCP | 11,285.00   | 11,271.50        | 11,298.50         |
| KuX - 7  | HP or LHCP | 12,855.00   | 12,841.50        | 12,868.50         | VP or RHCP | 11,305.00   | 11,291.50        | 11,318.50         |
| KuX - 8  | VP or RHCP | 12,865.00   | 12,851.50        | 12,878.50         | HP or LHCP | 11,315.00   | 11,301.50        | 11,328.50         |
| KuX - 9  | HP or LHCP | 12,885.00   | 12,871.50        | 12,898.50         | VP or RHCP | 11,335.00   | 11,321.50        | 11,348.50         |
| KuX - 10 | VP or RHCP | 12,895.00   | 12,881.50        | 12,908.50         | HP or LHCP | 11,345.00   | 11,331.50        | 11,358.50         |
| KuX - 11 | HP or LHCP | 12,915.00   | 12,901.50        | 12,928.50         | VP or RHCP | 11,365.00   | 11,351.50        | 11,378.50         |
| KuX - 12 | VP or RHCP | 12,925.00   | 12,911.50        | 12,938.50         | HP or LHCP | 11,375.00   | 11,361.50        | 11,388.50         |
| KuX - 13 | HP or LHCP | 12,945.00   | 12,931.50        | 12,958.50         | VP or RHCP | 11,395.00   | 11,381.50        | 11,408.50         |
| KuX - 14 | VP or RHCP | 12,955.00   | 12,941.50        | 12,968.50         | HP or LHCP | 11,405.00   | 11,391.50        | 11,418.50         |
| KuX - 15 | HP or LHCP | 12,975.00   | 12,961.50        | 12,988.50         | VP or RHCP | 11,425.00   | 11,411.50        | 11,438.50         |
| KuX - 16 | VP or RHCP | 12,985.00   | 12,971.50        | 12,998.50         | HP or LHCP | 11,435.00   | 11,421.50        | 11,448.50         |
| KuX - 17 | HP or LHCP | 13,170.00   | 13,156.50        | 13,183.50         | VP or RHCP | 10,720.00   | 10,706.50        | 10,733.50         |
| KuX - 18 | VP or RHCP | 13,180.00   | 13,166.50        | 13,193.50         | HP or LHCP | 10,730.00   | 10,716.50        | 10,743.50         |

Note: The uplinks for all 18 transponders are switchable in a single group between linear and circular polarization. Similarly, the downlinks for all 18 transponders are switchable in a single group between linear and circular polarization. The type of polarization (CP or LP) may be the same or different between uplinks and downlinks.

## A.5 SATELLITE TRANSMIT CAPABILITY

Figure A.5-1 shows the relative gain contours for the various different switchable downlink beams. Note that the beam coverage areas are designed to provide greater EIRP in the south and east of CONUS to combat the higher rain attenuation. The CONUS beam has a peak gain of 35.2 dBi and the North American beam has a peak gain of 33.3 dBi.

Each transponder will use either a single 120 Watt TWTA (“normal” mode) or two paralleled 120 Watt TWTAs (“high power” mode) giving a 2.8 dB increase in transmit EIRP. In high power mode, the combined TWTA saturated output power is approximately 23.6 dBW. The losses between the TWTA output and the antenna input amount to 1.7 dB. The resulting beam peak saturated EIRP level for the transponders in high power mode will be 57.1 dBW (i.e., 35.2+23.6-1.7) for the CONUS beam and 55.2 dBW (i.e., 33.3+23.6-1.7) for the North American beam. All of CONUS is within the -6 dB relative gain contour for both of these beams and therefore will receive an EIRP of greater than 51.1 dBW for the CONUS beam and 49.2 dBW for the North American beam. The EIRP levels in the south and east of CONUS are between 4 and 6 dB higher

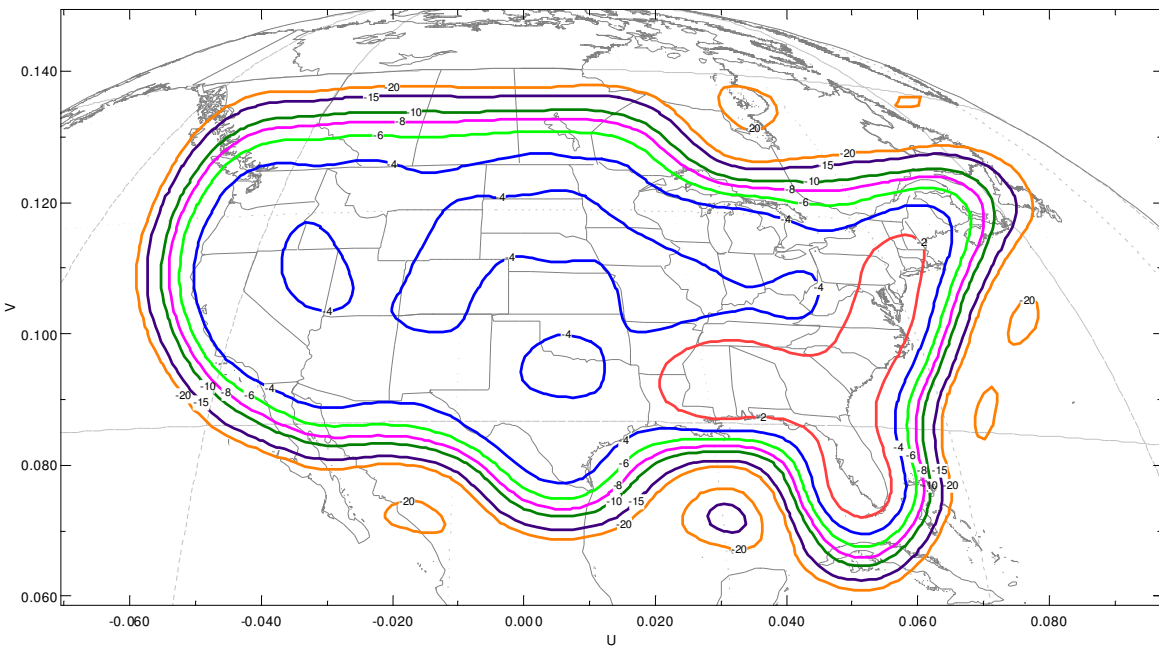
than this. Other parts of the service area (Canada, Mexico, the Caribbean, Alaska and Hawaii) receive an EIRP level generally in excess of 49 dBW in the case of the North American beam.

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

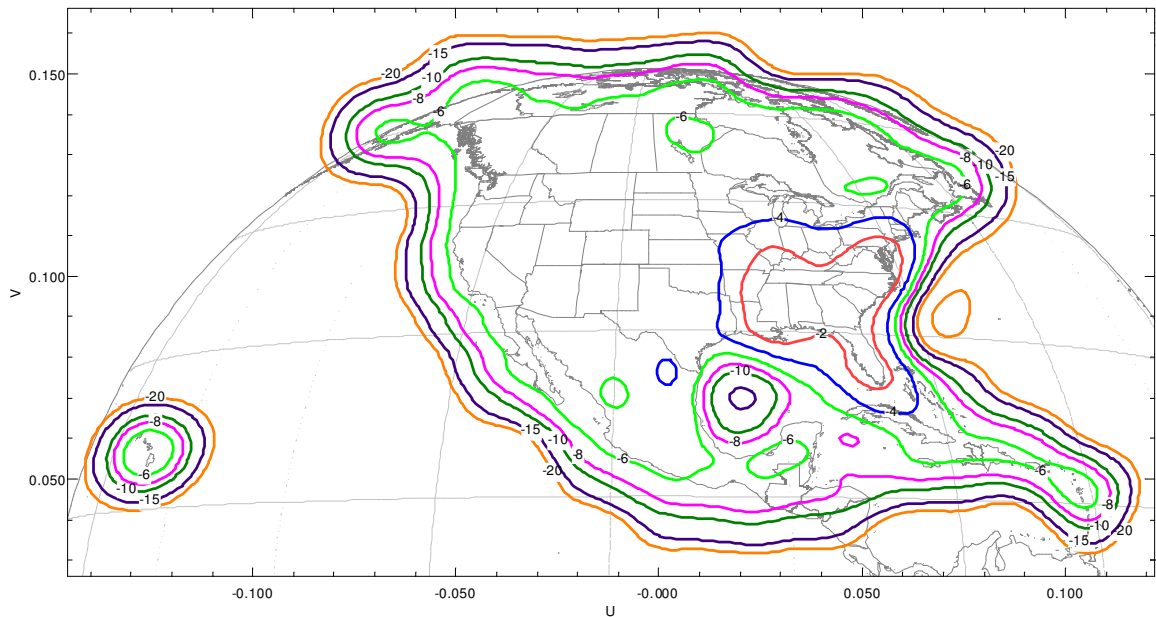
### Figure A.5-1 – Downlink Beam Coverages

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

(a) CONUS Beam



(b) North American Beam



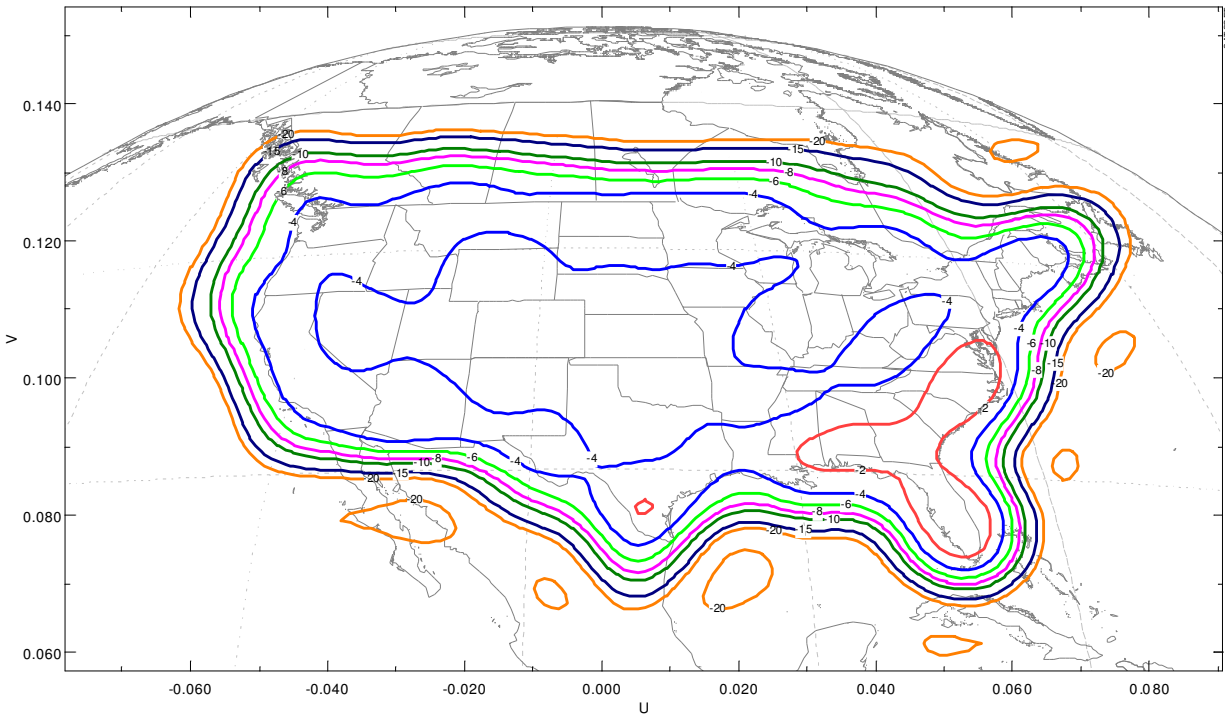
## A.6 SATELLITE RECEIVE CAPABILITY

The satellite will utilize a single shaped CONUS satellite receive beam intended primarily for feeder link uplink transmissions. Figure A.6-1 shows the gain contours of this beam. The peak receive antenna gain is 35.5 dBi. The beam peak G/T is 6.0 dB/K.

The cross-polar isolation of the satellite receive antenna used for the feeder uplinks to the conventional downlink transponders exceeds 30 dB within the -4 dB gain contour at all receive frequencies.

**Figure A.6-1 – Uplink Beam Coverage**

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



## A.7 TRANSMISSION SCHEMES

The transponders in the EchoStar-101W satellite are of the conventional bent-pipe type, with channel filtering consistent with the transponder bandwidths. Therefore the same transmission scheme will be used on both uplink and downlink for the same transponder. Digital modulation will be used throughout.

The main operating mode will be for a DTH application, where the feeder uplinks consist of a digital multiplex modulated onto a single carrier, and operating close to saturation of the transponder. The digital multiplex will be received by large numbers of small ground receive terminals, each capable of being programmed to receive certain information from the multiplex.

Alternative applications are also planned for the EchoStar-101W satellite involving small transmit/receive earth stations, although these applications are subject to successful completion of the Appendix 30B modification procedures. If this proves feasible, then a wide range of digital services, including interactive multi-media inbound links as well as conventional VSAT networks, can be provided over the satellite.

#### **A.8 TRANSPONDER GAIN CONTROL AND SATURATION FLUX DENSITY**

The EchoStar-101W transponders will be able to be operated in two gain modes. The first will be Automatic Level Control (“ALC”) mode which will be used in order to maintain the transponders operating at or very close to TWTA saturation, even in the presence of uplink signal fades due to rain attenuation effects. This is mainly intended for the DTH satellite service mode of operation. The second will be Fixed Gain (“FG”) mode where the gain through the transponder will be fixed but programmable by ground command over a 20 dB range in 1 dB steps.

In both ALC and FG modes the SFD will range from  $-76.4$  to  $-96.4$  dBW/m<sup>2</sup>.

#### **A.9 SATELLITE TRANSPONDER FILTER RESPONSE**

The specification for the overall transponder in-band filter response and out-of-band attenuation will be similar to that used on existing Ku-band FSS satellites. The performance in these respects 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 carrier(s) 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

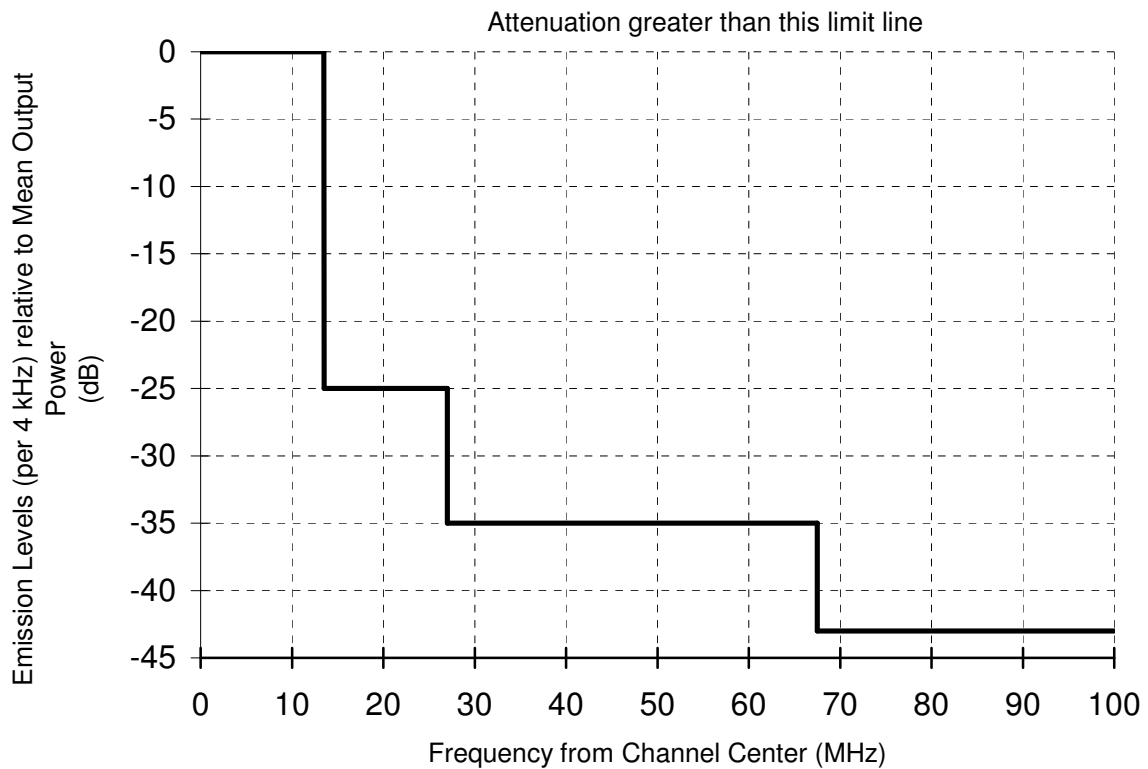


cause overload of the active amplifiers in the communications payload, or waste the available power of the TWTAs.

## 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**



## A.11 EMISSION DESIGNATORS AND ALLOCATED BANDWIDTH OF EMISSION

The emission designator for the DTH application is 27M0G7W. This has an allocated bandwidth of 27 MHz.

For the other types of applications the emission designators will vary, with the following being representative:

51K2G7W  
102KG7W  
205KG7W  
1M24G7W  
9M00G7W

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 earth station to be used with the EchoStar-101W satellite will be a receive only 90 cm antenna. Such terminals are expected to be deployed in large numbers across the service areas. In some areas and for certain applications, where higher clear-sky performance is required, larger antennas may be used (typically 100 cm, 120 cm, 150 cm or 180 cm). The feeder uplink earth stations (main and back-up) will use an 11 meter or larger antenna. Small transmit/receive earth stations may be deployed subject to successful coordination as indicated above.

## **A.13 LINK BUDGETS**

Tables A.13-1 and A.13-2 provide representative link budgets for the DTH links from the feeder link earth stations to the subscriber receive earth stations using the CONUS beam and North American beam, respectively. The link budgets assume the satellite is operated in normal mode (i.e., using a single 120W TWTA). Both clear sky and rain faded link budgets are shown – the latter for both New York (rain region K) and Los Angeles (rain region E). Availability in excess of 99.99% is achieved with the CONUS beam and 99.98% with the North American beam.

Table A.13-1 – Representative Link Budget for the CONUS Beam

| <b>EchoStar Extended Ku-Band Link Budget<br/>(Broadcast Link -- CONUS Beam)</b> |                       |                                 |                                 |                                    |
|---|-----------------------|---------------------------------|---------------------------------|------------------------------------|
| <b>Link Parameters</b>  |                       | <b>Clear Sky<br/>(New York)</b> | <b>Faded D/L<br/>(New York)</b> | <b>Faded D/L<br/>(Los Angeles)</b> |
| <b>Link Geometry:</b>   |                       |                                 |                                 |                                    |
| Tx E/S Range to Satellite (Cheyenne)  | (km)                  | 37,604                          | 37,604                          | 37,604                             |
| Rx E/S Range to Satellite   | (km)                  | 38,142                          | 38,142                          | 37,280                             |
| <b>Uplink (per carrier):</b>  |                       |                                 |                                 |                                    |
| Carrier Frequency   | (MHz)                 | 12,900                          | 12,900                          | 12,900                             |
| Tx E/S Antenna Diameter   | (m)                   | 11.0                            | 11.0                            | 11.0                               |
| Tx E/S Power to Antenna   | (W)                   | 40                              | 40                              | 40                                 |
| Tx E/S Antenna Gain   | (dB)                  | 61.6                            | 61.6                            | 61.6                               |
| Tx E/S EIRP per Carrier   | (dBW)                 | 77.6                            | 77.6                            | 77.6                               |
| Atmospheric and Other Losses  | (dB)                  | 0.3                             | 0.3                             | 0.3                                |
| Free Space Loss   | (dB)                  | 206.2                           | 206.2                           | 206.2                              |
| <b>Satellite:</b>   |                       |                                 |                                 |                                    |
| Total PFD at Satellite towards Tx E/S   | (dBW/m <sup>2</sup> ) | -89.4                           | -89.4                           | -89.4                              |
| Sat'n PFD towards Tx E/S (ALC mode)   | (dBW/m <sup>2</sup> ) | -89.4                           | -89.4                           | -89.4                              |
| G/T towards Tx E/S  | (dB/K)                | 1.8                             | 1.8                             | 1.8                                |
| Sat'd EIRP (Normal mode)  | (dBW)                 | 54.3                            | 54.3                            | 54.3                               |
| EIRP towards Rx E/S   | (dBW)                 | 53.1                            | 53.1                            | 51.1                               |
| <b>Downlink (per carrier):</b>  |                       |                                 |                                 |                                    |
| Carrier Frequency   | (MHz)                 | 11,300                          | 11,300                          | 11,300                             |
| Atmospheric and Other Losses  | (dB)                  | 0.2                             | 6.9                             | 3.4                                |
| Free Space Loss   | (dB)                  | 205.1                           | 205.1                           | 204.9                              |
| Rx E/S Antenna Diameter   | (m)                   | 0.90                            | 0.90                            | 0.90                               |
| Antenna Mis-pointing Error  | (dB)                  | 0.50                            | 0.50                            | 0.50                               |
| Rx E/S Antenna Gain   | (dB)                  | 38.7                            | 38.7                            | 38.7                               |
| Rx E/S G/T  | (dB/K)                | 17.5                            | 13.6                            | 14.6                               |
| System (LNA+Sky) Noise Temp.  | (K)                   | 130                             | 324                             | 253                                |
| <b>Total Link:</b>  |                       |                                 |                                 |                                    |
| Carrier Noise Bandwidth   | (kHz)                 | 27,000                          | 27,000                          | 27,000                             |
| (C/N) - Thermal Uplink  | (dB)                  | 27.2                            | 27.2                            | 27.2                               |
| (C/N) - Thermal Downlink  | (dB)                  | 19.1                            | 8.4                             | 11.2                               |
| (C/I) - Other Link Degradations   | (dB)                  | 15.0                            | 15.0                            | 15.0                               |
| (C/N) - Total Actual  | (dB)                  | 13.4                            | 7.5                             | 9.6                                |
| (C/N) - Total Required  | (dB)                  | 6.0                             | 6.0                             | 6.0                                |
| Excess Margin   | (dB)                  | 7.4                             | 1.5                             | 3.6                                |

Table A.13-2 Representative Link Budget for the North American Beam

| <b>EchoStar Extended Ku-Band Link Budget<br/>(Broadcast Link -- North American Beam)</b> |                       |                         |                         |                            |
|--|-----------------------|-------------------------|-------------------------|----------------------------|
| Link Parameters  |                       | Clear Sky<br>(New York) | Faded D/L<br>(New York) | Faded D/L<br>(Los Angeles) |
| <b>Link Geometry:</b>  |                       |                         |                         |                            |
| Tx E/S Range to Satellite (Cheyenne)   | (km)                  | 37,604                  | 37,604                  | 37,604                     |
| Rx E/S Range to Satellite  | (km)                  | 38,142                  | 38,142                  | 37,280                     |
| <b>Uplink (per carrier):</b>   |                       |                         |                         |                            |
| Carrier Frequency  | (MHz)                 | 12,900                  | 12,900                  | 12,900                     |
| Tx E/S Antenna Diameter  | (m)                   | 11.0                    | 11.0                    | 11.0                       |
| Tx E/S Power to Antenna  | (W)                   | 40                      | 40                      | 40                         |
| Tx E/S Antenna Gain  | (dB)                  | 61.6                    | 61.6                    | 61.6                       |
| Tx E/S EIRP per Carrier  | (dBW)                 | 77.6                    | 77.6                    | 77.6                       |
| Atmospheric and Other Losses   | (dB)                  | 0.3                     | 0.3                     | 0.3                        |
| Free Space Loss  | (dB)                  | 206.2                   | 206.2                   | 206.2                      |
| <b>Satellite:</b>  |                       |                         |                         |                            |
| Total PFD at Satellite towards Tx E/S  | (dBW/m <sup>2</sup> ) | -89.4                   | -89.4                   | -89.4                      |
| Sat'n PFD towards Tx E/S (ALC mode)  | (dBW/m <sup>2</sup> ) | -89.4                   | -89.4                   | -89.4                      |
| G/T towards Tx E/S   | (dB/K)                | 1.8                     | 1.8                     | 1.8                        |
| Sat'd EIRP (Normal mode)   | (dBW)                 | 52.4                    | 52.4                    | 52.4                       |
| EIRP towards Rx E/S  | (dBW)                 | 50.4                    | 50.4                    | 47.1                       |
| <b>Downlink (per carrier):</b>   |                       |                         |                         |                            |
| Carrier Frequency  | (MHz)                 | 11,300                  | 11,300                  | 11,300                     |
| Atmospheric and Other Losses   | (dB)                  | 0.2                     | 5.3                     | 2.6                        |
| Free Space Loss  | (dB)                  | 205.1                   | 205.1                   | 204.9                      |
| Rx E/S Antenna Diameter  | (m)                   | 0.90                    | 0.90                    | 0.90                       |
| Antenna Mis-pointing Error   | (dB)                  | 0.50                    | 0.50                    | 0.50                       |
| Rx E/S Antenna Gain  | (dB)                  | 38.7                    | 38.7                    | 38.7                       |
| Rx E/S G/T   | (dB/K)                | 17.5                    | 13.9                    | 15.1                       |
| System (LNA+Sky) Noise Temp.   | (K)                   | 130                     | 299                     | 228                        |
| <b>Total Link:</b>   |                       |                         |                         |                            |
| Carrier Noise Bandwidth  | (kHz)                 | 27,000                  | 27,000                  | 27,000                     |
| (C/N) - Thermal Uplink   | (dB)                  | 27.2                    | 27.2                    | 27.2                       |
| (C/N) - Thermal Downlink   | (dB)                  | 16.4                    | 7.7                     | 8.5                        |
| (C/I) - Other Link Degradations  | (dB)                  | 15.0                    | 15.0                    | 15.0                       |
| (C/N) - Total Actual   | (dB)                  | 12.5                    | 6.9                     | 7.5                        |
| (C/N) - Total Required   | (dB)                  | 6.0                     | 6.0                     | 6.0                        |
| Excess Margin  | (dB)                  | 6.5                     | 0.9                     | 1.5                        |

#### **A.14 STATION-KEEPING AND ANTENNA POINTING ACCURACY**

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

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

Article 21 of the ITU Radio Regulations contain GSO FSS Power Flux Density (“PFD”) limits that apply in the 10.7-10.95 GHz and 11.2-11.45 GHz bands for the protection of the Fixed Service (“FS”). The Article 21 PFD limits are identical to those contained in §25.208(b), which currently apply only in the 10.95-11.2 GHz and 11.45-11.7 GHz bands. The PFD limits of Article 21 and §25.208(b) are as follows:

- $-150$  dB(W/m<sup>2</sup>) in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- $-150 + (\delta - 5)/2$  dB(W/m<sup>2</sup>) in any 4 kHz band for angles of arrival  $\delta$  (in degrees) between 5 and 25 degrees above the horizontal plane; and
- $-140$  dB(W/m<sup>2</sup>) in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

Compliance with these limits is demonstrated below for both high and low elevation angles.

The maximum saturated EIRP per transponder is 55.2 dBW for the North American beam and 57.1 dBW for the CONUS beam. 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  $-106.9$  dBW/m<sup>2</sup> in the 27 MHz transponder bandwidth for the North American beam and could not exceed  $-105.0$  dBW/m<sup>2</sup> in 27 MHz for the CONUS beam. Allowing for the use of digital modulation with an almost flat spectrum, the corresponding maximum PFD at the Earth's surface measured in a 4 kHz band would not exceed  $-145.2$  dBW/m<sup>2</sup> for the North American beam and would not exceed  $-143.3$  dBW/m<sup>2</sup> for the CONUS beam. The higher-powered CONUS beam produces PFD levels that are 3.3 dB lower than the PFD limit

applicable for angles of arrival greater than 25 degrees. Therefore, compliance with the PFD limits at high angles of arrival is assured.

An analysis was performed in order to verify that the PFD limits at low arrival angles are not exceeded. Tables A.15-1 and A.15-2 show the results of analyses that determined the highest downlink EIRP that occurs anywhere along the 0°, 5° and 25° angles of arrival for the North American beam and CONUS beam, respectively. From the Tables, it can be seen that the smallest amount of excess PFD margin is 1.5 dB, therefore compliance with the PFD limits of §25.208(b) at low angles of arrival is also assured.

**Table A.15-1 – Worst Case PFD Levels at Low Arrival Angles (North American Beam)**

| Angle of Arrival | Applicable PFD Limit for Angle of Arrival (dBW/m <sup>2</sup> /4 kHz) | EchoStar-101W Satellite's Highest Downlink EIRP Level at Angle of Arrival (dBW/27 MHz) | EchoStar-101W Satellite's Worst Case PFD Level at Angle of Arrival (dBW/m <sup>2</sup> /4 kHz) | Excess PFD Margin (dB) |
|------------------|---|--|--|------------------------|
| 0°               | -150  | 50.0   | -151.7   | 1.7                    |
| 5°               | -150  | 50.1   | -151.5   | 1.5                    |
| 25°              | -140  | 51.1   | -150.0   | 10.0                   |

**Table A.15-2 – Worst Case PFD Levels at Low Arrival Angles (CONUS Beam)**

| Angle of Arrival | Applicable PFD Limit for Angle of Arrival (dBW/m <sup>2</sup> /4 kHz) | EchoStar-101W Satellite's Highest Downlink EIRP Level at Angle of Arrival (dBW/27 MHz) | EchoStar-101W Satellite's Worst Case PFD Level at Angle of Arrival (dBW/m <sup>2</sup> /4 kHz) | Excess PFD Margin (dB) |
|------------------|---|--|--|------------------------|
| 0°               | -150  | 35.0   | -166.7   | 16.7                   |
| 5°               | -150  | 35.6   | -166.0   | 16.0                   |
| 25°              | -140  | 51.5   | -149.6   | 9.6                    |

For narrowband carriers, the maximum downlink EIRP density will not exceed -19.1 dBW/Hz for the North American beam and will not exceed -17.2 dBW/Hz for the CONUS beam, thereby ensuring that the PFD limits are not exceeded.

#### **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  $\pm 5$  in  $10^6$  under all circumstances.

#### **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 is 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 at the edges of the service link frequency band. The final selection of TT&C frequencies within that 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-101W satellite. This will also 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 (either the CONUS or the North American beam) 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-101W 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-101W satellite requires approximately 7.5 kW d.c. power. Total spacecraft power requirements are approximately 9.5 kW d.c. power which necessitates beginning of life solar array power production capability of approximately 10.5 kW. The communications payload mass (including antenna) will be approximately 290 kg which results in a total spacecraft dry mass of approximately 1690 kg. The total spacecraft launch mass is in the range 3800 to 4400 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 communications payload will be conventional in architecture and very similar to EchoStar's existing Ku-band satellites. The main difference will be the exact frequency ranges over which the payload equipment has to operate.

The uplink signals in both senses of polarization will be received by the single satellite receive antenna (see Figure A.6-1 for the beam characteristics), with the type of polarization (CP or LP) being switchable at the receive antenna feed. Limited filtering is then applied before amplification in the 12/13 GHz LNAs (Low Noise Amplifier) and further amplification and down-conversion (to the 11 GHz downlink frequencies) in the receivers. The outputs of the receivers (one active receiver for each polarization) will be channelized by the IMUX (Input Multiplexer) before further amplification and ALC/gain control in the CAMPs (Channel Amplifiers) and then the TWTAs (Traveling Wave Tube Amplifiers). The individual RF channels in the same polarization are then combined in the OMUXs (Output Multiplexers) and fed to the satellite transmit antenna, with appropriate feed switching provided to enable the use of either circular or linear polarization on the downlink. Appropriate redundancy switching is provided for all active payload equipment.

## **A.22 INTERFERENCE ANALYSIS (ADJACENT GSO SATELLITES)**

### **A.22.1 Downlink Interference to 90 cm Earth Stations**

The downlink interference due to adjacent GSO satellites spaced  $2^\circ$  apart in the geostationary orbit can be calculated by comparing the gain of the 90 cm receiving antenna at  $2.2^\circ$  off-axis (which is  $29-25\log(2.2) = 20.4$  dBi) with the peak gain of the antenna (38.7 dBi), as given in the link budget

in Section A.13 above.<sup>1</sup> The difference between these two is 18.3 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 slightly 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 90 cm earth station size and 2° orbital spacing.

While the preceding demonstrates compliance with a two degree spacing environment, it should be noted that there are no operational satellites that are two degrees away from the 101° W.L. slot and which use the requested Appendix 30B bands.

#### **A.22.2 Uplink Interference from 11 meter Feeder Link Earth Station**

An 11 meter transmitting feeder link earth station will have a peak gain of approximately 61.6 dBi at 12.9 GHz (see link budget in Section A.13 above) and will comply with the off-axis gain mask of  $29-25\log(\theta)$ . Therefore, there will clearly be ample interference margin for operation in a 2° orbital spacing environment, again noting that there are no operational satellites that are two degrees away from the 101° W.L. slot and which use the requested Appendix 30B bands.

#### **A.22.3 Uplink Interference from 90 cm User Terminals**

While EchoStar desires to use uplink terminals as small as 90 cm, it recognizes that such use needs to be coordinated in a manner consistent with the framework of the Appendix 30B Plan. It is EchoStar's intention to use the smallest uplink terminals that can be successfully coordinated with potentially affected administrations, including U.S. licensees.

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<sup>1</sup> 2.2° corresponds to the topocentric angle, and is an approximation as it depends on the location of the earth station relative to the sub-satellite point.

### **A.23 SHARING ANALYSIS WITH OTHER SERVICES AND ALLOCATIONS**

Although §25.208 does not contain any GSO FSS PFD limits for the 10.7-10.95 GHz and 11.2-11.45 GHz bands, the GSO FSS PFD limits that apply to the 10.95-11.2 GHz and 11.45-11.7 GHz bands are also sufficient to protect the FS in the 10.7-10.95 GHz and 11.2-11.45 GHz bands.<sup>2</sup> Therefore, FS stations currently licensed to use spectrum within the 10.7-10.95 GHz and 11.2-11.45 GHz bands are protected by observance of the PFD limits contained in §25.208(b) of the Rules. Section A.15 demonstrates that the EchoStar-101W satellite will not exceed the PFD limits of §25.208(b) of the Rules and therefore FS stations are adequately protected from interference.

There also exists the potential for interference from FS stations into receive earth station terminals. EchoStar expects that its receive terminals can co-exist within this interference environment in most geographic areas of the country, while maintaining an acceptable quality of service.

The 12.75-13.2 GHz uplink band is shared domestically on a co-primary basis with a variety of Fixed Service types. Uplink earth stations operating with the EchoStar-101W satellite will be coordinated with terrestrial services following the procedures of §25.203 of the Rules.

EchoStar intends to provide protection to the Radio Astronomy Service operating in the adjacent 10.68-10.7 GHz band as required by footnote US211 of the U.S. Table of Frequency Allocations.

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<sup>2</sup> Article 21 of the international Radio Regulations contain GSO FSS PFD limits that apply in the 10.7-10.95 GHz and 11.2-11.45 GHz bands for the protection of the FS. The Article 21 PFD limits are identical to those contained in §25.208(b).

**Exhibit 2**

**INTERNATIONAL COORDINATION**

**EXHIBIT 2**  
**APPENDIX TO TECHNICAL ANNEX**  
**(EHOSTAR-101W )**

**ANNEX 2A TO APPENDIX 4 INFORMATION FOR**  
**EHOSTAR-101W at 101° W.L. for APPENDIX 30B**

| <b>Item Number</b> | <b>Item Description</b>  | <b>Item Value</b>                            | <b>Comments</b> |
|--------------------|--|--|-----------------|
| <b>A.1</b>         | <b>Identity of the satellite network</b>   |  |                 |
| A.1.a              | Identity of a satellite network  | EHOSTAR-101W                                 |                 |
| A.1.d              | Country<br><br>Identification of the allotment; for a network not derived from the Allotment Plan, the identity of the network | United States of America<br><br>EHOSTAR-101W |                 |
| A.1.f              | Country symbol of the notifying administration   | USA  |                 |
| <b>A.2</b>         | <b>Date of bringing into use</b>   |  |                 |
| A.2.a              | The date of bringing the frequency assignments into use  | July 3, 2008                                 |                 |
| <b>A.3</b>         | <b>Operating administration or agency</b>  | 120  |                 |
| <b>A.4</b>         | <b>Orbital information</b>   |  |                 |
| A.4.a.1            | The nominal geographical longitude on the geostationary-satellite orbit  | 101°W  |                 |
| A.4.a.2            | Planned longitudinal tolerance<br>Planned inclination excursion  | ± 0.05<br>± 0.05                             |                 |
| A.4.a.4            | Service arc  | 97°W - 105°W                                 |                 |
| <b>A.5</b>         | <b>Coordination</b>  | None   |                 |
| <b>A.6</b>         | <b>Agreements with other administrations</b>   | None   |                 |
| <b>A.18</b>        | <b>Subregional systems</b>   | Not applicable                               |                 |

## Earth-to-Space Direction

| Item Number | Item Description  | Item Value   | Comments                                      |
|-------------|---|--|---|
| <b>B</b>    | <b>Characteristics to be provided for each satellite antenna beam</b>   |  |   |
| <b>B.1</b>  | <b>Designation of the satellite antenna beam</b>  | RX   |   |
| <b>B.2</b>  | <b>Transmission/reception indicator (E or R)</b>  | R  |   |
| <b>B.3</b>  | <b>Geostationary space station antenna characteristics</b>  |  |   |
| B.3.d       | The pointing accuracy of the antenna  | $\pm 0.15^\circ$   |   |
| B.3.g.1     | Co-polar gain (dBi)   | 35.5   |   |
| B.3.g.5     | <p>For beams of other than elliptical shape, the co-polar gain contours</p> <p>Beam aim point longitude and latitude;</p> <p>For a steerable beam, the maximum antenna gain and the effective antenna gain contours</p> | <p>GXT filename: RX.GXT</p> <p>27.354°N, -81.364°E</p> <p>Not applicable</p> | Peak gain coordinates; this is a shaped beam. |

## Earth-to-Space Direction

| Item Number | Item Description   | Item Value   | Comments  |
|-------------|--|--|---|
| C           | <b>Characteristics to be provided for each group of frequency assignments for a satellite antenna beam</b>   |  |   |
| C.1         | <b>Frequency range for Earth-to-space service area</b>   | 12.7515 - 12.9985 GHz and<br>13.1565 - 13.1935 GHz   |   |
| C.2.a       | The assigned frequencies in GHz  | 12.765<br>12.775<br>12.795<br>12.805<br>12.825<br>12.835<br>12.855<br>12.865<br>12.885<br>12.895<br>12.915<br>12.925<br>12.945<br>12.955<br>12.975<br>12.985<br>13.170<br>13.180 | Center frequencies of each frequency assignment |
| C.3.a       | The bandwidth of the assigned frequency band in kHz  | 27000  |   |
| C.5         | <b>Receiving system noise temperature</b>  |  |   |
| C.5.a       | In the case of a space station, the lowest total receiving system noise temperature (K) referred to the output of the receiving antenna of the space station | 900  |   |
| C.7.a       | Designation of emissions   | 51K2G7W<br>102KG7W<br>205KG7W<br>1M24G7W<br>9M00G7W<br>27M0G7W   |   |

## Earth-to-Space Direction

| Item Number | Item Description   | Item Value                               |               | Comments |
|-------------|--|--|---------------|----------|
| <b>C.8</b>  | <b>Power characteristics of the transmission</b>   |  |               |          |
| C.8.j       | Maximum power density (dB(W/Hz)) averaged over the necessary bandwidth of the modulated carrier, supplied to the input of the antenna<br>Frequency below which signals whose peak-to-average ratio is less than 5 dB will be located<br>Maximum carrier power density (dB(W/Hz)) averaged over the worst 4 kHz band, supplied to the antenna input | -42.0<br><br>Not applicable<br><br>-42.0 |               |          |
| <b>C.10</b> | <b>Type and identity of the associated station(s)</b>  |  |               |          |
| C.10.b      | For a specific associated earth station, the identity of the earth station and the geographical coordinates of the antenna site.   | Not applicable                           |               |          |
| C.10.c      | For associated typical earth stations the type and identity  | Type                                     | Identity      |          |
|             |  | 0.9m                                     | TYP-0.9M      |          |
|             |  | 1.0m                                     | TYP-1.0M      |          |
|             |  | 1.2m                                     | TYP-1.2M      |          |
|             |  | 1.5m                                     | TYP-1.5M      |          |
|             |  | 1.8m                                     | TYP-1.8M      |          |
|             |  | 3.0m                                     | TYP-3.0M      |          |
|             |  | 11m                                      | TYP-11M       |          |
| C.10.c.2    | Isotropic gain (dBi) of the antenna in the direction of maximum radiation  | Identity                                 | Gain (dBi)    |          |
|             |  | TYP-0.9M                                 | 39.8          |          |
|             |  | TYP-1.0M                                 | 40.8          |          |
|             |  | TYP-1.2M                                 | 42.3          |          |
|             |  | TYP-1.5M                                 | 44.3          |          |
|             |  | TYP-1.8M                                 | 45.9          |          |
|             |  | TYP-3.0M                                 | 50.3          |          |
|             |  | TYP-11M                                  | 61.6          |          |
| C.10.c.3    | Beamwidth (degrees) between the half power points  | Identity                                 | Beamwidth (°) |          |
|             |  | TYP-0.9M                                 | 1.75          |          |
|             |  | TYP-1.0M                                 | 1.58          |          |
|             |  | TYP-1.2M                                 | 1.31          |          |
|             |  | TYP-1.5M                                 | 1.05          |          |
|             |  | TYP-1.8M                                 | 0.88          |          |
|             |  | TYP-3.0M                                 | 0.53          |          |
|             |  | TYP-11M                                  | 0.14          |          |



### Earth-to-Space Direction

| Item Number | Item Description  | Item Value  |                | Comments                                    |
|-------------|---|---|----------------|---|
| C.10.c.4    | Antenna radiation pattern   | 29 - 25 log (FI)                                  |                | Applicable to all associated earth stations |
| C.10.c.5    | Lowest total receiving system noise temperature (K), referred to the output of the receiving antenna of the earth station under clear-sky conditions, when the associated station is a receiving earth station; | Not applicable                                    |                |   |
| <b>C.11</b> | <b>Service area</b>   |   |                |   |
| C.11.b      | A set of a maximum of 20 test points and a service area contour   | Latitude (°N)                                     | Longitude (°E) |   |
|             |   | 33.73   | -84.38         |   |
|             |   | 41.50   | -81.68         |   |
|             |   | 41.83   | -87.75         |   |
|             |   | 39.08   | -94.62         |   |
|             |   | 34.00   | -118.25        |   |
|             |   | 42.87   | -78.92         |   |
|             |   | 47.60   | -122.32        |   |
|             |   | 38.67   | -90.25         |   |
|             |   | 25.77   | -80.18         |   |
|             |   | 40.75   | -74.00         |   |
|             |   | 45.00   | -93.25         |   |
|             |   | 29.75   | -95.42         |   |
|             |   | 33.50   | -112.05        |   |
|             |   | 38.92   | -77.00         |   |
|             |   | 39.78   | -104.98        |   |
|             |   | The service area is defined by the -6 dB contour. |                |   |
| <b>C.12</b> | <b>Required protection ratio</b><br>The minimum acceptable aggregate carrier-to-interference ratio, if less than 26 dB.   | Not applicable                                    |                |   |

## Space-to-Earth Direction

| Item Number | Item Description   | Item Value   |            | Comments                                       |
|-------------|--|--|------------|--|
| <b>B</b>    | <b>Characteristics to be provided for each satellite antenna beam</b>                  |  |            |  |
| <b>B.1</b>  | <b>Designation of the satellite antenna beams</b>                                      | TX1<br>TX2   |            |  |
| <b>B.2</b>  | <b>Transmission/reception indicator (E or R)</b>                                       | E  |            |  |
| <b>B.3</b>  | <b>Geostationary space station antenna characteristics</b>                             |  |            |  |
| B.3.d       | The pointing accuracy of the antenna   | ±0.15°   |            | Applicable to both TX1 and TX2 beams           |
| B.3.g.1     | Co-polar gain (dBi)  | Beam   | Gain (dBi) |  |
|             |  | TX1  | 35.2       |  |
|             |  | TX2  | 33.3       |  |
| B.3.g.5     | For beams of other than elliptical shape, the co-polar gain contours                   | TX1 GXT filename: TX1.GXT<br>TX2 GXT filename: TX2.GXT         |            | Peak gain coordinates; these are shaped beams. |
|             | Beam aim point longitude and latitude  | Beam TX1: 32.761°N, -88.801°E<br>Beam TX2: 35.789°N, -78.885°E |            |  |
|             | For a steerable beam, the maximum antenna gain and the effective antenna gain contours | Not applicable   |            |  |

### Space-to-Earth Direction

| Item Number | Item Description   | Item Value   | Comments  |
|-------------|--|--|---|
| C           | <b>Characteristics to be provided for each group of frequency assignments for a satellite antenna beam</b>   |  |   |
| C.1         | <b>Frequency range for Earth-to-space service area</b>   | 10.7065-10.7435 GHz and<br>11.2015-11.4485 GHz   |   |
| C.2.a       | The assigned frequencies in GHz  | 11.215<br>11.225<br>11.245<br>11.255<br>11.275<br>11.285<br>11.305<br>11.315<br>11.335<br>11.345<br>11.365<br>11.375<br>11.395<br>11.405<br>11.425<br>11.435<br>10.720<br>10.730 | Center frequencies of each frequency assignment |
| C.3.a       | The bandwidth of the assigned frequency band in kHz  | 27000  |   |
| C.5         | <b>Receiving system noise temperature</b>  |  |   |
| C.5.a       | In the case of a space station, the lowest total receiving system noise temperature (K) referred to the output of the receiving antenna of the space station | Not applicable   |   |
| C.7.a       | Designation of emissions   | 51K2G7W<br>102KG7W<br>205KG7W<br>1M24G7W<br>9M00G7W<br>27M0G7W   |   |

### Space-to-Earth Direction

| Item Number | Item Description   | Item Value   |               | Comments |
|-------------|--|--|---------------|----------|
| <b>C.8</b>  | <b>Power characteristics of the transmission</b>   |  |               |          |
| C.8.j       | Maximum power density (dB(W/Hz)) averaged over the necessary bandwidth of the modulated carrier, supplied to the input of the antenna<br>Frequency below which signals whose peak-to-average ratio is less than 5 dB will be located<br>Maximum carrier power density (dB(W/Hz)) averaged over the worst 4 kHz band, supplied to the antenna input | Beam TX1: -17.2<br>Beam TX2: -19.1<br><br>Not applicable<br><br>Beam TX1: -17.2<br>Beam TX2: -19.1 |               |          |
| <b>C.10</b> | <b>Type and identity of the associated station(s)</b>  |  |               |          |
| C.10.b      | For a specific associated earth station, the identity of the earth station and the geographical coordinates of the antenna site.   | Not applicable   |               |          |
| C.10.c      | For associated typical earth stations the type and identity  | Type   | Identity      |          |
|             |  | 0.9m   | TYP-0.9M      |          |
|             |  | 1.0m   | TYP-1.0M      |          |
|             |  | 1.2m   | TYP-1.2M      |          |
|             |  | 1.5m   | TYP-1.5M      |          |
|             |  | 1.8m   | TYP-1.8M      |          |
|             |  | 3.0m   | TYP-3.0M      |          |
|             |  | 11m  | TYP-11M       |          |
| C.10.c.2    | Isotropic gain (dBi) of the antenna in the direction of maximum radiation  | Identity   | Gain (dBi)    |          |
|             |  | TYP-0.9M   | 38.7          |          |
|             |  | TYP-1.0M   | 39.6          |          |
|             |  | TYP-1.2M   | 41.2          |          |
|             |  | TYP-1.5M   | 43.1          |          |
|             |  | TYP-1.8M   | 44.7          |          |
|             |  | TYP-3.0M   | 49.2          |          |
|             |  | TYP-11M  | 60.4          |          |
| C.10.c.3    | Beamwidth (degrees) between the half power points  | Identity   | Beamwidth (°) |          |
|             |  | TYP-0.9M   | 2.00          |          |
|             |  | TYP-1.0M   | 1.80          |          |
|             |  | TYP-1.2M   | 1.50          |          |
|             |  | TYP-1.5M   | 1.20          |          |
|             |  | TYP-1.8M   | 1.00          |          |
|             |  | TYP-3.0M   | 0.60          |          |
|             |  | TYP-11M  | 0.16          |          |

### Space-to-Earth Direction

| <b>Item Number</b> | <b>Item Description</b>   | <b>Item Value</b> | <b>Comments</b>                             |
|--------------------|---|-------------------|---|
| C.10.c.4           | Antenna radiation pattern   | 29 - 25 log (FI)  | Applicable to all associated earth stations |
| C.10.c.5           | Lowest total receiving system noise temperature (K), referred to the output of the receiving antenna of the earth station under clear-sky conditions, when the associated station is a receiving earth station; | 130               |   |

### Space-to-Earth Direction

| Item Number                                       | Item Description  | Item Value   |                | Comments                |
|---|---|--|----------------|-------------------------|
| <b>C.11</b>                                       | <b>Service area</b>   |  |                |                         |
| C.11.b  | A set of a maximum of 20 test points and a service area contour   | Latitude (°N)                                      | Longitude (°E) | Applicable to Beam TX1. |
|   |   | 33.73  | -84.38         |                         |
|   |   | 41.50  | -81.68         |                         |
|   |   | 41.83  | -87.75         |                         |
|   |   | 39.08  | -94.62         |                         |
|   |   | 34.00  | -118.25        |                         |
|   |   | 42.87  | -78.92         |                         |
|   |   | 47.60  | -122.32        |                         |
|   |   | 38.67  | -90.25         |                         |
|   |   | 25.77  | -80.18         |                         |
|   |   | 40.75  | -74.00         |                         |
|   |   | 45.00  | -93.25         |                         |
|   |   | 29.75  | -95.42         |                         |
|   |   | 33.50  | -112.05        |                         |
|   |   | 38.92  | -77.00         |                         |
|   |   | 39.78  | -104.98        |                         |
|   |   | The service area is defined by the -6 dB contour . |                |                         |
| C.11.b  | A set of a maximum of 20 test points and a service area contour   | Latitude (°N)                                      | Longitude (°E) | Applicable to Beam TX2. |
|   |   | 57.58  | -157.10        |                         |
|   |   | 21.32  | -157.83        |                         |
|   |   | 33.73  | -84.38         |                         |
|   |   | 41.50  | -81.68         |                         |
|   |   | 41.83  | -87.75         |                         |
|   |   | 39.08  | -94.62         |                         |
|   |   | 34.00  | -118.25        |                         |
|   |   | 42.87  | -78.92         |                         |
|   |   | 47.60  | -122.32        |                         |
|   |   | 38.67  | -90.25         |                         |
|   |   | 25.77  | -80.18         |                         |
|   |   | 40.75  | -74.00         |                         |
|   |   | 45.00  | -93.25         |                         |
|   |   | 29.75  | -95.42         |                         |
|   |   | 33.50  | -112.05        |                         |
|   |   | 38.92  | -77.00         |                         |
| 39.78   | -104.98   |  |                |                         |
| 19.42   | -99.17  |  |                |                         |
| 18.48   | -66.13  |  |                |                         |
| 53.57   | -113.42   |  |                |                         |
| The service area is defined by the -6 dB contour. |   |  |                |                         |
| <b>C.12</b>                                       | <b>Required protection ratio</b><br>The minimum acceptable aggregate carrier-to-interference ratio, if less than 26 dB. | Not applicable                                     |                |                         |

**Notes:**

1. Beams TX1 and TX2 can be used with any downlink frequency assignment. However, for any particular downlink frequency assignment, only one of the beams can be operated at any one time.
2. Strapping Table:

| <b>No.</b> | <b>Earth-to-Space</b> |                        | <b>Space-to-Earth</b> |                        |
|------------|-----------------------|------------------------|-----------------------|------------------------|
|            | <b>Polarization</b>   | <b>Frequency (GHz)</b> | <b>Polarization</b>   | <b>Frequency (GHz)</b> |
| 1          | HP or LHCP            | 12.765                 | VP or RHCP            | 11.215                 |
| 2          | VP or RHCP            | 12.775                 | HP or LHCP            | 11.225                 |
| 3          | HP or LHCP            | 12.795                 | VP or RHCP            | 11.245                 |
| 4          | VP or RHCP            | 12.805                 | HP or LHCP            | 11.255                 |
| 5          | HP or LHCP            | 12.825                 | VP or RHCP            | 11.275                 |
| 6          | VP or RHCP            | 12.835                 | HP or LHCP            | 11.285                 |
| 7          | HP or LHCP            | 12.855                 | VP or RHCP            | 11.305                 |
| 8          | VP or RHCP            | 12.865                 | HP or LHCP            | 11.315                 |
| 9          | HP or LHCP            | 12.885                 | VP or RHCP            | 11.335                 |
| 10         | VP or RHCP            | 12.895                 | HP or LHCP            | 11.345                 |
| 11         | HP or LHCP            | 12.915                 | VP or RHCP            | 11.365                 |
| 12         | VP or RHCP            | 12.925                 | HP or LHCP            | 11.375                 |
| 13         | HP or LHCP            | 12.945                 | VP or RHCP            | 11.395                 |
| 14         | VP or RHCP            | 12.955                 | HP or LHCP            | 11.405                 |
| 15         | HP or LHCP            | 12.975                 | VP or RHCP            | 11.425                 |
| 16         | VP or RHCP            | 12.985                 | HP or LHCP            | 11.435                 |
| 17         | HP or LHCP            | 13.170                 | VP or RHCP            | 10.720                 |
| 18         | VP or RHCP            | 13.180                 | HP or LHCP            | 10.730                 |