Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Eutelsat S.A.	)	
	)	
Petition for Declaratory Ruling for	)	File No.:
EUTELSAT 133WB To Access the	)	Call Sign:
U.S. Market and To Be Added to the	)	
Permitted Space Station List at the	)	
Nominal 133° W.L. Orbital Location	)	

Permit-but-Disclose Status Requested

PETITION FOR DECLARATORY RULING

Eutelsat S.A. ("Eutelsat") submits this Petition for Declaratory Ruling ("Petition") pursuant to Section 25.137(a) of the Commission's rules, 47 C.F.R § 25.137(a), for the EUTELSAT 133WB satellite to access the U.S. market and be added to the Permitted Space Station List ("Permitted List") in Ku-band and Ka-band frequencies at the nominal 133° W.L. orbital location.[1] EUTELSAT 133WB is the planned replacement for the in-orbit EUTELSAT 133WA satellite, which will soon be relocated to the nominal 133° W.L. orbital location and which is the subject of a separate request for U.S. market access.[2]

In this Petition, Eutelsat demonstrates that it is legally, technically, and otherwise qualified to hold the requested authority; that the proposed facilities and operations are compliant with applicable Commission rules, regulations, and policies; and that grant of the Petition would

[1] Given the existence of a U.S.-licensed satellite at 133° W.L., Eutelsat seeks to operate the EUTELSAT 133WB satellite at the 132.85° W.L. orbital location to avoid potential overlap of satellite station-keeping boxes.

[2] *See* Petition for Declaratory Ruling of Eutelsat S.A., File No. SAT-PPL-20180122-00008, Call Sign S3026.

serve the public interest, convenience, and necessity. Eutelsat also demonstrates that waiver of certain satellite application processing rules, and other Commission rules and policies, would serve the public interest.

I. INTRODUCTION AND BACKGROUND

Eutelsat seeks to operate the EUTELSAT 133WB satellite at the nominal 133° W.L. orbital location in Ku-band and Ka-band frequencies to provide broadband connectivity for fixed-satellite service ("FSS") and mobility applications in the United States and other markets. The satellite would operate pursuant to regulatory authority granted to Eutelsat by the government of France to operate under French International Telecommunication Union ("ITU") satellite network filings, which have date priority at the 133° W.L. orbital location.

EUTELSAT 133WB is designed to greatly expand the range of satellite communications service to be provided by Eutelsat from 133° W.L. The satellite is intended to replace the Ku-band EUTELSAT 133WA satellite and is scheduled to commence operations in the second half of 2021, before EUTELSAT 133WA reaches the end of its operational life.

Except as indicated in the following list, and subject to grant of appropriate Commission earth station licenses, EUTELSAT 133WB will be able to support gateway links (with large, fixed earth stations) and user links (with smaller, fixed and mobility terminals) in its operational bands. The EUTELSAT 133WB design includes the following Ku-band frequencies: 10.7-10.95 GHz, 10.95-11.20 GHz, 11.2-11.45 GHz, 11.45-11.7 GHz, and 11.7-12.2 GHz (space-to-Earth); and 13.75-14.0 and 14.0-14.5 GHz (Earth-to-space). It also includes the following Ka-band frequencies: 17.8-18.3 GHz, 18.3-18.8 GHz, 18.8-19.3 GHz, 19.3-19.4 GHz, 19.6-19.7 GHz, 19.7-20.2 GHz (space-to-Earth); and 27.5-28.35 GHz (gateway only), 28.35-28.6 GHz, 28.6-29.1 GHz (gateway only), and 29.3-30.0 GHz (Earth-to-space).

Virtually all of the foregoing Ku-band and Ka-band frequencies have also been requested for use by Intelsat License LLC ("Intelsat") at 133° W.L. commencing sometime in 2022.[3] However, because EUTELSAT 133WB would operate pursuant to French ITU filings with earlier ITU date priority, absent coordination (which has not occurred and does not appear possible at this time) EUTELSAT 133WB would be permitted to operate and Intelsat would be effectively precluded from using the bands under well-settled Commission policies.

For the reasons discussed herein, grant of this Petition would serve the public interest by enhancing competition in the satellite connectivity market, ensuring uninterrupted satellite service from the nominal 133° W.L. orbital location, and expanding the range of advanced satellite broadband applications available from this location.

II. DISCUSSION

A. EUTELSAT 133WB Petition for Declaratory Ruling

The Commission will allow non-U.S. licensed satellites to access the U.S. market and will include them on the Permitted List upon demonstrating compliance with Sections 25.114 and 25.137 of the Commission's Rules, 47 C.F.R. §§ 25.114 & 25.137, and that the public interest would be served by grant of U.S. market access. This Petition and accompanying information, including the waivers requested herein, establish that granting U.S. market access for EUTELSAT 133WB would be consistent with the Commission's rules and policies, and would strongly serve the public interest.

[3] *See* Application for Authority to Launch and Operate Galaxy 15R, a Replacement Satellite with New Frequencies, at 133.0º W.L. (227.0º E.L.), File Nos. SAT-LOA-20170524-00078 and SAT-AMD-20170613-00086 (Call Sign S3015) ("Intelsat Application").

1. Legal Qualifications

The legal qualifications of Eutelsat are a matter of record before the Commission. Eutelsat and its affiliates – including Satelites Mexicanos, S.A. de C.V d/b/a Eutelsat Americas – operate many satellites that have been approved by the Commission for inclusion on the Permitted Space Station List or as authorized points of communication for U.S. earth station licensees;[4] and ES 172 LLC, a Eutelsat subsidiary, holds two Commission satellite licenses.[5] Eutelsat provides additional information regarding its legal qualifications in FCC Form 312 and relevant attachments to this Petition.

The proposed EUTELSAT 133WB satellite would operate under French licensing authority and France is a member country of the World Trade Organization ("WTO"). When, as in this case, an operator of a non-U.S. satellite licensed by a WTO-member country seeks authority to provide satellite service covered by the WTO Basic Telecommunications Agreement, the Commission presumes that foreign country participation will promote competition in the United States.[6] Accordingly, Eutelsat is not required to make the effective competitive opportunities showing under Section 25.137 of the Commission's rules.

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[4] *See, e.g.*, Permitted Space Station List (available at https://www.fcc.gov/permitted-space-station-list).

[5] *See* Radio Station Authorizations of ES 172 LLC, Call Signs 2610 and 3021 (various file numbers).

[6] *See* 47 C.F.R. § 25.137(a)(2); *see also Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Satellites Providing Domestic and International Service in the United States,* Report and Order, IB Docket No. 96-111, 12 FCC Rcd 24094, ¶ 39 (1997) ("We adopt our proposal to apply a presumption in favor of entry in considering applications to access non-U.S. satellites licensed by WTO members to provide services covered by the U.S. commitments under the WTO Basic Telecom Agreement.").

As noted above, Eutelsat would operate the EUTELSAT 133WB satellite at the 133° W.L. pursuant to regulatory authority issued by the government of France to operate French satellite network filings with ITU date priority at this orbital location. Because these satellite network filings have been submitted to the ITU for international coordination, the eligibility requirement of Section 25.137(c) for inclusion in the Commission's processing queue is satisfied.[7]

2. Technical Qualifications

Pursuant to Section 25.137(d) of the Commission's rules, 47 C.F.R. § 25.137(d), Eutelsat demonstrates in this Petition that the proposed operations of the EUTELSAT 133WB satellite comply with all applicable Commission requirements for non-U.S. licensed satellites to operate in the United States. Eutelsat provides the attached Engineering Statement, Schedule S, and associated materials containing information relating to the proposed technical and operational characteristics of the EUTELSAT 133WB satellite.

a. Spectrum Availability

The following table shows the frequencies, divided into the band segments discussed below, that would be available for use on the proposed EUTELSAT 133WB satellite:

Ku-band		
	Downlink	10.7-10.95 GHz
		10.95-11.2 GHz
		11.2-11.45 GHz
		11.45-11.7 GHz
		11.7-12.2 GHz
	Uplink	13.75-14.0 GHz
		14.0-14.5 GHz

[7] *See* 47 C.F.R. § 25.137(c)(3).

Ka-band		
	Downlink	17.8-18.3 GHz
		18.3-18.8 GHz
		18.8-19.3 GHz
		19.3-19.4 GHz
		19.6-19.7 GHz
		19.7-20.2 GHz
	Uplink	27.5-28.35 GHz (gateway only)
		28.35-28.6 GHz
		28.6-29.1 GHz (gateway only)
		29.3-30.0 GHz

In the Ku-band, Eutelsat seeks to add EUTELSAT 133WB to the Permitted List, which includes use of the 10.95-11.2 GHz, 11.45-11.7 GHz, and 13.75-14.0 GHz bands (the "extended Ku-band"), as well as the 11.7-12.2 GHz and 14.0-14.5 GHz bands (the "conventional Ku-band"). Eutelsat includes information in this Petition regarding the 10.7-10.95 GHz and 11.2-11.45 GHz bands should future earth station applicants seek to operate with EUTELSAT 133WB in these bands, subject to compliance with applicable Commission rules and policies.

In the Ka-band, Eutelsat seeks to add EUTELSAT 133WB to the Permitted List, which includes use of the 18.3-18.8 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz, and 29.3-30.0 GHz bands (the "conventional Ka-band").[8] Eutelsat includes information in this Petition regarding the 17.8-18.3 GHz, 18.8-19.3 GHz, 19.3-19.4 GHz, 19.6-19.7 GHz, 27.5-28.35 GHz, and 28.6-29.1 GHz bands should future earth station applicants seek to operate with EUTELSAT 133WB in these bands, subject to compliance with applicable Commission rules and policies.

[8] Eutelsat understands the "conventional Ka-band" also includes the 29.25-29.3 GHz sub-band, 47 C.F.R. § 25.103, but Eutelsat has not included this sub-band in order to avoid frequency overlap with the feeder link uplinks of the Iridium mobile-satellite service ("MSS") system.

The subject Ku-band and Ka-band frequencies include appropriate allocations for FSS and mobility operations that would be supported by the proposed EUTELSAT 133WB satellite. An overview of planned operations in the subject bands follows.

b. Spectrum Access

The EUTELSAT 133WB advanced satellite design makes it capable of responding to real-time changes in capacity demands, as well as growth in regional and aggregate demand over time. In particular, the satellite's design employs overlapping Ku-band and Ka-band spot beam patterns to potentially support fixed and mobility applications, as well as associated gateway operations, in any beam within the coverage area. Additionally, onboard flexibility will facilitate real-time spectrum and power allocation to address changes in user demand and maximize the efficiency of services provided to users in the United States and elsewhere.

The United States Table of Frequency Allocations ("Table of Allocations"), Section 2.106 of the Commission's Rules, 47 C.F.R. § 2.106, identifies conditions for spectrum use by FSS satellite networks in the Ku-band and Ka-band frequencies in which the EUTELSAT 133WB satellite is designed to operate. Except as noted herein, including certain requests for limited waiver of the Commission's rules, Eutelsat acknowledges and accepts applicable conditions for access to the bands proposed herein.

Eutelsat addresses below applicable rule provisions and contemplated limitations on EUTELSAT 133WB's proposed operations. The following discussion focuses largely on provisions affecting satellite operations, rather than restrictions on earth station operations in the relevant bands. This discussion is not a full restatement of operational conditions or an exhaustive examination of Commission rules, but rather it is intended to highlight material issues affecting EUTELSAT 133WB's use of these bands for service to the United States.

- Eutelsat acknowledges that use of the bands 10.7-10.95 GHz and 11.2-11.45 GHz must be in accordance with the provisions of Appendix 30B, consistent with Footnote 5.441 to the Table of Allocations, 47 C.F.R. §2.106.
- Eutelsat acknowledges that operations in the 10.7-10.95 GHz, 10.95-11.20 GHz and 11.45-11.7 GHz bands must comply with the terms of footnote US211 to the Table of Allocations, 47 C.F.R. §2.106, which urges applicants to take all practicable steps to protect radio astronomy observations in the adjacent bands from harmful interference.
- Eutelsat acknowledges that applicants proposing uplink earth station operations with EUTELSAT 133WB in the 13.75-14.0 GHz band would be required to comply with FCC Report and Order 96-377 to protect U.S. government operations from harmful interference. In addition, Eutelsat would coordinate operation of the EUTELSAT 133WB satellite with relevant NASA operations.
- For operations in the 17.8-18.3 GHz, 18.3-18.8 GHz, 18.8-19.3 GHz, 19.3-19.4 GHz, 19.6-19.7 GHz, and 19.7-20.2 GHz bands, Eutelsat would coordinate its space-to-Earth operations with Federal FSS systems in accordance with footnote US334 to the Table of Allocations, 47 C.F.R. §2.106.
- Eutelsat acknowledges that operations in 18.6-18.8 GHz band must comply with the Table of Allocations, 47 C.F.R. §2.106 which establishes Earth Exploration, Space Research, and FSS as co-primary services.
- Eutelsat would comply with footnote NG165 to the Table of Allocations, 47 C.F.R. §2.106, and the Commission's Ka-band Plan, which require that in the bands 18.8-19.3 GHz and 28.6-29.1 GHz, GSO FSS networks shall not cause harmful interference to, or claim protection from, NGSO FSS systems. In the 28.6-29.1 GHz band, Eutelsat proposes gateway operations only and would coordinate operations in both of the foregoing bands with existing and future NGSO systems.
- Eutelsat acknowledges that FSS operations are secondary to Upper Microwave Flexible Use Service ("UMFUS") operations in the 27.5-28.35 GHz band and that restrictions on earth station operations embodied in Section 25.136 of the Commission's rules, 47 C.F.R. § 25.136, limit use of the band. Accordingly, in the 27.5-28.35 GHz band Eutelsat proposes gateway operations only.

Eutelsat also notes that operations throughout the 10.7-11.7 GHz band are subject to the terms of Footnote NG52 to the Table of Allocations, 47 C.F.R. §2.106, which provides that use of these bands by GSO FSS networks shall be limited to international systems (with the exception of mobility operations in certain sub-bands that may not claim protection from interference). Eutelsat requests herein a waiver of the international system limitation.

3. Other Issues

a. Milestone Requirements

The EUTELSAT 133WB satellite would comply with the milestone requirements set forth in Section 25.164(a) of the Commission's rules, 47 C.F.R. §25.164(a), because its planned launch and entry into service time frame is well before the end of the five-year deadline from the potential date of grant of this Petition for launch and operation of the satellite.

b. Bond Requirements

Eutelsat acknowledges that EUTELSAT 133WB would be subject to the performance bond requirements set forth in Section 25.165 of the Commission's rules, 47 C.F.R. §25.165, because additional Ku-band and Ka-band frequencies on this satellite are not included on the EUTELSAT 133WA satellite it seeks to replace.

4. Public Interest Considerations

Eutelsat proposes to launch and operate the EUTELSAT 133WB satellite to replace the EUTELSAT 133WA satellite, which, if authorized to serve the U.S. market, will enable satellite service to U.S. consumers using spectrum and orbital resources that are currently unused and would otherwise remain fallow. The follow-on EUTELSAT 133WB satellite would greatly expand the range of satellite services available from the 133° W.L. orbital location, and thus it

constitutes a viable, long-term enhancement of competition and consumer choice in the U.S. broadband satellite communications marketplace.

Like the EUTELSAT 133WA satellite, EUTELSAT 133WB would operate under French satellite filings with ITU date priority at 133° W.L. in relevant Ku-band and Ka-band frequencies. Under the Commission's well-settled date priority policies, any U.S.-licensed satellite seeking to use these bands at this location would not be permitted to operate in a manner that would cause harmful interference to Eutelsat satellites operating under the French ITU filings.

Eutelsat seeks to launch and operate the EUTELSAT 133WB satellite at 133° W.L. before the anticipated deployment of Intelsat's proposed satellite. In addition, because EUTELSAT 133WB would operate under French satellite network filings with ITU date priority in virtually all of the Ku-band and Ka-band frequencies requested by Intelsat, the deployment and operation of EUTELSAT 133WB would appear to effectively preclude Intelsat's proposed use of the bands at this location. Thus, the Commission should substantively consider this Petition for U.S. market access even during the pendency of the Intelsat Application. Furthermore, because the Ku-band and Ka-band operations of EUTELSAT 133WB have earlier ITU date priority and are otherwise consistent with Commission rules and policies, grant of the Petition would serve the public interest.

5. Waiver Requests

The Commission has authority to grant waivers of its rules for "good cause shown."[9] In general, good cause exists if grant of a waiver would not undermine the purposes of the rule and

[9] *See* 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

would otherwise serve the public interest.[10] Grant of the following waiver requests would be consistent with these Commission policies and its waiver precedent.

a. Satellite Station-keeping Tolerance

Eutelsat respectfully requests a waiver of Section 25.210(j) of the Commission's rules, 47 C.F.R. § 25.210(j), which requires satellite operators to maintain station-keeping within ± 0.05° of their assigned orbital longitude in the east/west direction, unless specifically authorized by the Commission to operate with a different longitudinal tolerance. The Commission has previously allowed an increased station-keeping tolerance based on a finding that doing so would not adversely affect the operations of other spacecraft and would have benefits such as conserving fuel for future operations.[11]

Eutelsat seeks to operate the proposed EUTELSAT 133WB satellite with an increased station-keeping window of ± 0.10°. Operating with this station-keeping tolerance would have no adverse impact on other operators because the window will not overlap with that of any other satellites.[12] A station-keeping tolerance of ± .10° also would afford Eutelsat additional operational flexibility and conserve fuel onboard the satellite. Finally, Eutelsat notes that the EUTELSAT 133WA satellite will operate at 132.85° W.L. to accommodate a ± .10° station-keeping box and that its replacement should operate with similar characteristics to facilitate the seamless transition of customer services. Under these circumstances, permitting EUTELSAT

[10] *WAIT Radio*, 418 F.2d at 1157; *Intelsat North America LLC*, 22 FCC Rcd. 11989 ¶6 (2007).

[11] *See, e.g.*, SES Americom, Inc. Application for Modification of Satcom SN-4 Fixed Satellite Space Station License, 20 FCC Rcd 11542, 11545 (Sat. Div. 2005).

[12] The satellite will operate at 132.85° W.L. to avoid overlap of its station-keeping box with that of the Galaxy 15 satellite located at 133.0° W.L.

133WB to operate with a larger station-keeping tolerance under Section 25.210(j) would serve the public interest.

Eutelsat notes that the Commission has repeatedly granted authority to operate with a ± .10° station-keeping tolerance, subject to the condition that authority to operate with the larger tolerance shall terminate in the event that another satellite is launched into a location such that its station-keeping volume would overlap the satellite's ± 0.10° station-keeping volume, but would not overlap a ± 0.05° station-keeping volume, unless the satellite operator has successfully coordinated its physical operations with those of the other spacecraft.[13] Eutelsat acknowledges and accepts this condition.

b. Footnote NG52 International System Limitation

Eutelsat requests a waiver of Footnote NG52 to the Table of Allocations, 47 C.F.R. §2.106, which provides that use of the 10.7-11.7 GHz band by GSO FSS networks shall be limited to international systems (with the exception of specified mobility operations that are permitted but may not claim protection from interference in certain sub-bands). This limitation affects Eutelsat's proposal to operate EUTELSAT 133WB in each of the 10.7-10.95 GHz, 10.95-11.20 GHz, 11.2-11.45 GHz, and 11.45-11.7 GHz bands.

The Commission has previously found that waiving Footnote NG52 does not undermine the purpose of the rules if the applicant seeking a waiver: (i) will only receive in the bands and thus is not capable of causing interference into fixed service stations in the bands; and (ii) agrees to accept any level of interference from fixed service stations in the bands.[14] Grant of the

[13] *See, e.g.*, FCC ISAT List, available at https://www.fcc.gov/isat-list (noting multiple waivers for Inmarsat 3F and 4F satellites).

[14] *See* EchoStar KuX Corporation Application for Authority to Construct, Launch and Operate a Geostationary Satellite Using the Extended Ku-band Frequencies in the Fixed-Satellite Service at the 83º W.L. Orbital Location, Order and Authorization, DA 04-3162, ¶ 9 (Sept. 30, 2004); *see*

requested waiver in each of the band segments within the 10.7-11.7 GHz band would be consistent with this precedent.

Eutelsat will support non-international earth station operations in the 10.7-11.7 GHz band only on an unprotected, non-harmful non-interference basis. In addition, Eutelsat agrees to comply with the customer notification requirements relating to the status of service and acceptance of interference that the Commission has previously imposed when granting a waiver of Footnote NG52.[15] Thus, the requested waiver would not raise potential interference concerns, would not constrain terrestrial fixed service operations in any way, and would not implicate other public interest concerns.[16]

To the extent the Commission determines that a waiver may not be warranted in any of the foregoing sub-bands, Eutelsat respectfully requests that the Commission grant the requested waiver in the other appropriate sub-bands (i.e., the requested waiver need not be considered as "all or nothing" across the entire 10.7-11.7 GHz band). In addition, because mobility operations have already been permitted in certain sub-bands and present no potential for interference or constraints on terrestrial fixed service operations, Eutelsat respectfully requests at a minimum that it be permitted to support mobility operations throughout the 10.7-11.7 GHz band.

c. Queue Procedure and Application Processing Policies

Pursuant to Section 25.137(c), 47 C.F.R. § 25.137(c), a non-U.S. licensed GSO-like satellite seeking to serve the United States can have its request placed in a queue and considered

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also DIRECTV Enterprises, LLC, File No. SAT-MOD-20170221-00019, Call Sign S2922, Condition 10 (May 11, 2017).

[15] *See* DIRECTV Enterprises, LLC, File No. SAT-MOD-20170221-00019, Call Sign S2922, Condition 10(b) (May 11, 2017).

[16] *See generally id.* at Condition 10.

before later-filed applications of other U.S. satellite system operators. Eutelsat notes that the Intelsat Application includes virtually all of the bands included in the EUTELSAT 133WB satellite design, and that Section 25.158 of the rules, 47 C.F.R. § 25.158, and associated Commission policies generally would result in deferral of the Petition during the pendency of the Intelsat Application. Eutelsat requests a waiver of these rules and policies to the extent necessary to accept the Petition for filing and substantively consider the issues raised herein.

Eutelsat plans to operate the EUTELSAT 133WB satellite as a replacement satellite, with additional frequencies, that is scheduled to commence operations prior to the contemplated launch of Intelsat's proposed satellite at 133° W.L. Given the satellites' substantial Ku-band and Ka-band frequency and geographic coverage overlap, absent coordination Eutelsat's earlier implementation of EUTELSAT 133WB would effectively preclude operation of any other satellite in these bands at 133° W.L. The Commission should substantively consider this Petition along with the Intelsat Application because the EUTELSAT 133WB proposal has a direct and material impact on the ability of Intelsat's proposed satellite to operate, and therefore has a direct and material impact on the Commission's consideration of the Intelsat Application.

The Intelsat Application and this Petition together raise complex procedural and substantive issues. Comprehensive Commission consideration of these inextricably intertwined issues may take considerable effort and briefing by interested parties. Deferring consideration of this Petition during the pendency of the Intelsat Application would deprive the Commission and interested parties of the opportunity to fully examine many of these important issues. In contrast, grant of the requested waiver would in no way constrain Commission action in either proceeding (including affording Eutelsat and Intelsat additional time to explore fundamental compatibility

issues), but instead would enhance the records to assist the Commission in reaching determinations in each proceeding that would best serve the public interest.

In sum, granting a waiver to permit substantive consideration of this Petition would not undermine the underlying purposes of the Commission's application processing rules and policies in the circumstances presented here. EUTELSAT 133WB's planned operations will commence before those contemplated by Intelsat, they have earlier ITU date priority, and they appear mutually exclusive with those described in the pending Intelsat Application. These unique circumstances implicate procedural and substantive issues of first impression for the Commission. As a result, grant of the requested waiver would serve the public interest by allowing full consideration of these important issues.

B. Other Issues

1. Waiver Required by 47 U.S.C. § 304

As required by Section 304 of the Communications Act of 1934, as amended, 47 U.S.C. § 304, although included in FCC Form 312, Eutelsat hereby separately waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise.

2. Permit-but-Disclose Status

Eutelsat respectfully requests that the Commission designate this petition for declaratory ruling proceeding as "permit-but-disclose" for purposes of its *ex parte* rules. The Commission

has discretion to modify the application of its *ex parte* rules in any proceeding where the public interest warrants doing so.[17]

Designating this application proceeding as "permit-but-disclose" under Section 1.1206 of the Commission's rules, rather than "restricted" under Section 1.1208 of the rules,[18] would facilitate more thorough consideration of the unique public interest issues presented here and would ensure a more complete record for the Commission to consider in taking appropriate action on this Petition.

III. CONCLUSION

Eutelsat seeks authority for EUTELSAT 133WB to access the U.S. market and to be added to the Permitted List at the nominal 133° W.L. orbital location using Ku-band and Ka-band frequencies for which France holds ITU date priority. This Petition establishes that Eutelsat is legally, technically and otherwise qualified to hold the requested authority, and that the proposed facilities and operations are consistent with the Commission's rules, regulation and policies. For the reasons set forth herein, substantive consideration and grant of this Petition would strongly serve the public interest, convenience and necessity.

[17] *See* 47 C.F.R. § 1.1200(a).

[18] *See* 47 C.F.R. §§ 1.1206, 1.1208.

Attachment A

FCC Form 312, Response to Questions 34 and 40: Foreign Ownership, Officers, Directors, and Ten Percent or Greater Shareholders of Eutelsat S.A.

Eutelsat S.A. is a *société anonyme* organized under the laws of France. The address of Eutelsat S.A. is 70 rue Balard, 75015 Paris, France. An organizational chart showing the ownership of Eutelsat S.A. is attached.

96.37% of Eutelsat S.A.'s share capital is held by Eutelsat Communications S.A., the publicly traded parent of Eutelsat S.A. In addition, the Russian Satellite Communications Company ("RSCC") holds 3.38% of the shares issued by Eutelsat S.A. and 0.31% of the shares of Eutelsat S.A. are held by other non-Eutelsat entities as set out on the ownership chart attached hereto. RSCC and these other entities have no control over Eutelsat S.A. All shareholdings of Eutelsat S.A. (other than the 0.11% of such shares held by Eutelsat S.A.'s employees and executives) are a result of the privatization of Eutelsat S.A., formerly an intergovernmental organization.

26.45% of the share capital of Eutelsat Communications S.A. is held by Bpifrance Participations (formerly named Fonds Stratégique d'Investissement ("FSI")), a *société anonyme* formed in 2008 to enhance equity in France and help stabilize French companies during the economic crisis. Approximately 51% of the FSI's share capital is held by the Caisse des Dépôts et Consignations (the "CDC") and approximately 49% of its share capital is held directly by the French State. Bpifrance Participations must present its strategic plans and annual report to the supervisory commission of the CDC. The Bpifrance Participations' board of directors has ten members. Three of the directors are representatives of the CDC, three of the directors are representatives of the French State and three of the directors are qualified personalities. The chief executive officer of Bpifrance Participations is appointed by its board of directors. The address of Bpifrance Participations is 27-31, avenue du Général Leclerc, 94710 Maisons-Alfort, Cedex, France.

The CDC is a financial institution wholly owned by the French State that serves the general interest and the economic development of France. Approximately 50% of the CDC's recurring and non-recurring net profit is paid to the French State. The CDC is managed by a chief executive officer, who is appointed by the President of the French State. The CDC is supervised by a supervisory commission of 13 members, all of which are appointed by various sectors of the French government.

7.50% of the share capital of Eutelsat Communications is held by Fonds Stratégique de Participation (FSP). Backed by six major French insurance companies (BNP PARIBAS CARDIF, CNP ASSURANCES, CREDIT AGRICOLE ASSURANCES, SOGECAP (SOCIETE

GENERALE group), GROUPAMA and NATIXIS ASSURANCES), the FSP is a long-term equity investor in French companies. Through FSP, insurance companies and key institutional investors with long-term liabilities channel some of France's long-term savings into equity investments.

6.60% of the share capital of Eutelsat Communications S.A. is held by Land Breeze s.a.r.1. Land Breeze s.a.r.l. is organized under the laws of Luxembourg and is a wholly owned subsidiary of China Investment Corp. ("CIC"). Two other subsidiaries of CIC organized under the laws of the People's Republic of China, Flourish Investment Corporation and Best Investment Corporation (together with Land Breeze s.a.r.l., the "CIC Entities"), own 0.06% and 0.01% of the shares of Eutelsat Communications, S.A., respectively. Information about CIC can be found on its website: http://www.chinainv.cn/cicen/.

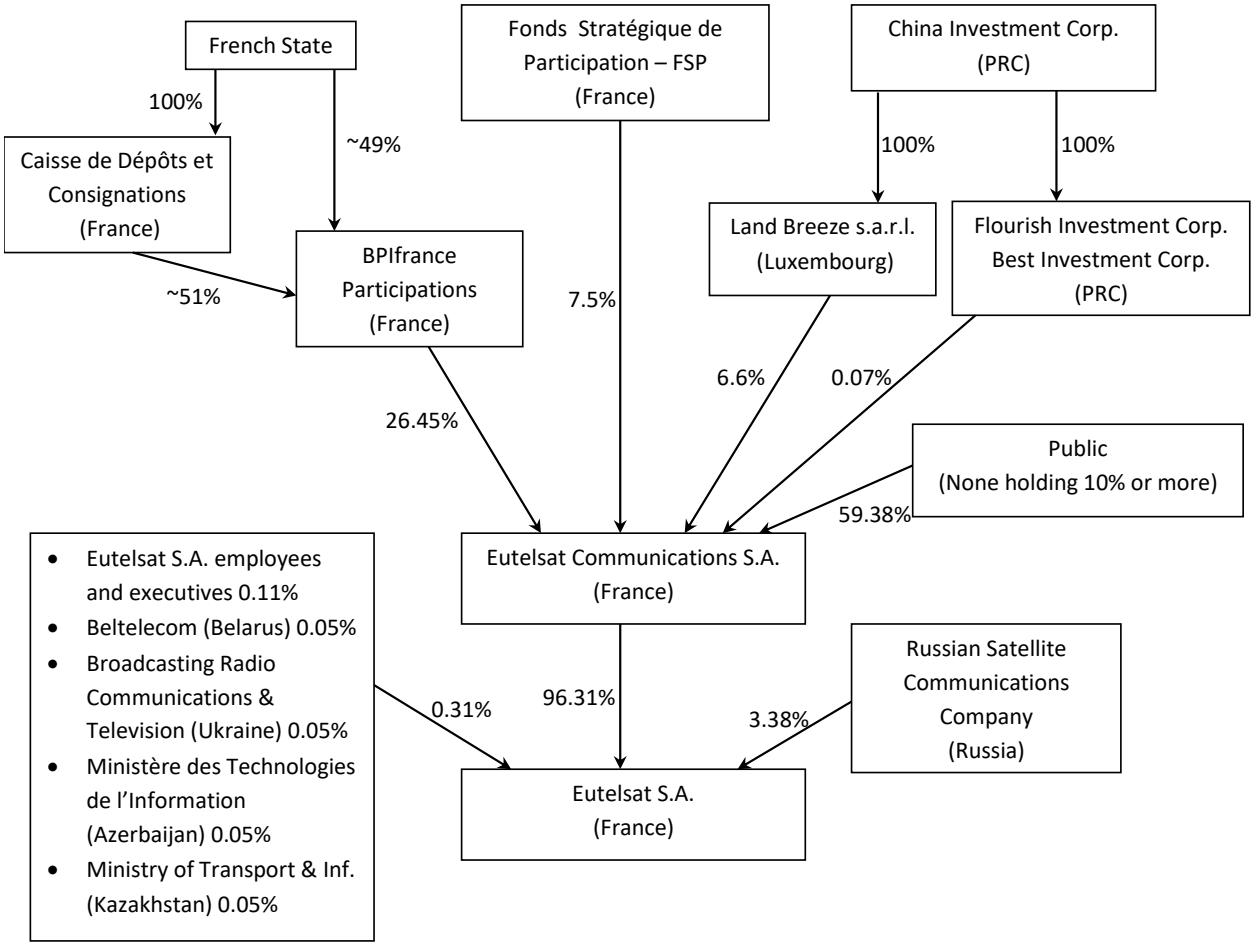
To the best of Eutelsat Communications S.A.'s knowledge, no other shareholders own, directly or indirectly, more than 10% of its share capital or voting rights. Eutelsat Communications S.A. is managed by a board of directors that currently has 12 members, each of whom has a four-year renewable term of office. Currently, eight of the directors are independent, three are affiliated with the Bpifrance Participations. No decisions of the board of directors can be taken or be blocked by three directors. Neither the Bpifrance Participations, nor any of the CIC Entities or FSP, nor any foreign government or person controlled by or acting on behalf of a foreign government has or will have the right or power to appoint any of Eutelsat Communications S.A.'s principal officers. None of the CIC Entities or FSP has the right or power to appoint any of Eutelsat Communications S.A.'s directors.

More information about Eutelsat Communications S.A., its shareholders, and its governance can be found on its website at www.eutelsat.com.

Principal officers of Eutelsat Communications S.A. include:

Rodolphe Belmer, CEO
Michel Azibert, Deputy CEO
Yohann Leroy, Deputy CEO

The individuals listed above can be contacted c/o Eutelsat S.A., 70 rue Balard, 75015 Paris, France. Mr. Belmer, Mr. Azibert and Mr. Leroy are citizens of the Republic of France.


French State
100%
~49%
Caisse de Dépôts et Consignations (France)
~51%
BPIfrance Participations (France)
Fonds Stratégique de Participation – FSP (France)
7.5%
China Investment Corp. (PRC)
100%
100%
Land Breeze s.a.r.l. (Luxembourg)
Flourish Investment Corp. Best Investment Corp. (PRC)
6.6%
0.07%
26.45%
Public (None holding 10% or more)
59.38%
Eutelsat Communications S.A. (France)
• Eutelsat S.A. employees and executives 0.11%
• Beltelecom (Belarus) 0.05%
• Broadcasting Radio Communications & Television (Ukraine) 0.05%
• Ministère des Technologies de l'Information (Azerbaijan) 0.05%
• Ministry of Transport & Inf. (Kazakhstan) 0.05%
0.31%
96.31%
3.38%
Russian Satellite Communications Company (Russia)
Eutelsat S.A. (France)

Attachment B – Regulatory Compliance Matrix

Reference	Reference Location	Topic / Reason for (n/a)
25.114(a)(1)	FCC Form 312, Schedule S, Attachment C	Overall context of filing
25.114(a)(2)	n/a	NGSO constellation
25.114(a)(3)	n/a	Application filed pursuant to two-step procedure
25.114(b)	Form 312	Waiver required by 47 U.S.C 304
25.114(c)(1)	Schedule-S	Applicant info
25.114(c)(2)	Schedule-S	Info for correspondence person
25.114(c)(3)	Schedule-S	Type of authorization
25.114(c)(4)(i)	Schedule-S	Channel frequency, bandwidth and polarization
25.114(c)(4)(ii)	Schedule-S	Maximum EIRP and EIRP density of TX beams
25.114(c)(4)(v)	Schedule-S	RX beam: G/T, SFD
25.114(c)(4)(vi)(A)	Schedule-S	GSO: Antenna Gain Contours
25.114(c)(4)(vi)(B)	n/a	NGSO: Antenna Gain Contours
25.114(c)(4)(vi)(C)	n/a	Shapeable Beams: Antenna Gain Contours
25.114(c)(4)(vi)(D)	n/a	Steerable, non-shapeable beams
25.114(c)(4)(vii)(A-C)	n/a	GSO: Large number of spot beams
25.114(c)(5)(i-v)	Schedule-S	GSO: Orbital parameters
25.114(c)(6)(i-ix)	n/a	NGSO: Orbital parameters
25.114(c)(7)	Schedule-S	Frequency Bands, Types of Service and Coverage Areas
25.114(c)(8)	Schedule-S, See 25.208	TX Beams: PFD
25.114(c)(10)	Schedule-S	Operational Lifetime
25.114(c)(11)	Schedule-S	Common Carrier Status
25.114(c)(13)	n/a	17/24 GHz BSS polarization isolation
25.114(d)(1)	Narrative, Attachment C - Section 2	Overall description
25.114(d)(6)	Narrative	Public Interest
25.114(d)(7)	See 25.140(a)	Interference Analysis
25.114(d)(8)	n/a	L-Band MSS
25.114(d)(9)	n/a	MSS: Multiple Satellites
25.114(d)(10)	n/a	L/S-Band MSS
25.114(d)(11)	n/a	DBS
25.114(d)(12)	n/a	NGSO FSS
25.114(d)(13)(i-ii)	n/a	DBSS
25.114(d)(14)(i-v)	Attachment D - Orbital Debris	Orbital Debris
25.114(d)(15)(i-v)	n/a	17/24 GHZ BSS
25.114(d)(16)	n/a	17/24 GHZ BSS
25.114(d)(17)	n/a	17/24 GHZ BSS
25.114(d)(18)	n/a	17/24 GHZ BSS

Reference	Reference Location	Topic / Reason for (n/a)
25.137(a)	Narrative	Requirements for U.S. market access request
25.137(b)	FCC Form 312, Schedule S, Attachment C, Narrative	Legal and technical information required for U.S. market access
25.137(c)	Narrative – Section II(A)(1) and II(A)(5)(c)	Queue placement
25.137(d)	Narrative –Section II(A)	Non-U.S.-licensed satellite requirements
25.137(e-g)	n/a	Changes/modifications
25.140(a)(3)(i)	n/a	C-band limits
25.140(a)(3)(ii)	Attachment C - Section 14	Ku-band limits
25.140(a)(3)(iii)	Attachment C - Section 14	Ka-band limits
25.140(a)(3)(iv)	Attachment C - Section 14	AP30B limits
25.140(a)(3)(v)	Attachment C - Section 14.1	2-degree spacing interference analysis
25.140(d)	n/a	Non-routine transmission levels
25.156(a)	Narrative	Application consideration - general
25.158	Narrative – Section II(A)(1) and II(A)(5)(c)	Application consideration - GSO
25.159	n/a	Unbuilt systems
25.172(a)(1-4)	Attachment C – Section 4	TT&C Reporting
25.202(e)	Attachment C - Section 7	Frequency Tolerance
25.202(f)(1-3)	Attachment C - Section 8	Out of band - emissions
25.202(g)	Attachment C – Section 4	TT&C on band edge
25.207	Attachment C - Section 10	Cessation of Emissions
25.208(a-g)	Attachment C - Section 12	PFD Analysis
25.210(f)	Attachment C - Section 9	Full Frequency Reuse
25.210(j)	Narrative Section II(A)(5)(a), Schedule S	EW Station keeping tolerance
25.283(a-c)	Attachment D - Orbital Debris	End-of-life Disposal

Attachment C - Engineering Statement

1. Scope

As required by Section 25.114 and other sections of the Part 25 rules, this Attachment contains additional information that cannot be entered into the Schedule S online submission system regarding the proposed EUTELSAT 133WB satellite, which is planned for launch at the nominal 133° W.L. orbital location in the second half of 2021 as a replacement for the EUTELSAT 133WA satellite.

2. General Description (Section 25.114(d)(1))

The EUTELSAT 133WB satellite will support advanced fixed-satellite service ("FSS") and mobility applications in the United States and other markets from the nominal 133° W.L. orbital location using Ku-band and Ka-band frequencies. (The satellite will actually operate at 132.85° W.L. to avoid overlap of its station-keeping box with that of the Galaxy 15 satellite located at 133.0° W.L.). It should be noted that the attached Schedule S rounds the satellite's proposed orbital location to 133 W.L.

The EUTELSAT 133WB satellite is designed to operate in the Ku-band using both linear polarizations, thereby providing dual-frequency reuse. The satellite is designed to operate in the Ka-band using both circular polarizations, thereby providing dual-frequency reuse in that band as well.

For both uplink and downlink operations, the EUTELSAT 133WB satellite will have 65 fixed, overlapping Ku-band spot beams and Ka-band spot beams that will serve the United States and immediate surrounding geographic areas. The 65-spot beam aggregated service area is illustrated in Exhibit 5. Additional spot beams will also be employed to cover other non-U.S. areas, but such information is not included in this Application.

The EUTELSAT 133WB communications payload is flexible with the ability to allocate various amounts of bandwidth and RF power to each of the beams to address real-time user demand and evolving operational and business requirements. The communications payload is further able to support various link configurations between Ku-band/Ka-band gateway beams and Ku-band/Ka-band service link beams depending on traffic demand and power/throughput requirements.

3. Spacecraft Overview

EUTELSAT 133WB is a 3-axis stabilized, GSO HTS communication satellites composed of the following subsystems:

- Propulsion – orbit raising, station keeping and deorbit
- Power – collection, storage and distribution of DC electrical power
- Attitude Control – maintain the correct position and attitude of the spacecraft
- Thermal Management – ensure that all internal units are maintained within the required temperature range
- Telemetry, Tracking and Control ("TT&C") – enable satellite command and control with a high level of reliability during the entire mission life through deorbit

- Uplink Power Control ("ULPC") – provide a carrier with fixed power level enabling the adjustment of earth station uplink power to compensate for rain fading
- Communications Payload

EUTELSAT 133WB is designed for a 15-years mission life and incorporates redundancy in each of the various subsystems to avoid single points of failure.

The EUTELSAT 133WB satellite will be capable of operating in the Ku-band and Ka-band frequencies listed below:

Ku-band Uplink	**Ku-band Downlink**
13.75 – 14.0 GHz	10.7 – 10.95 GHz
14.0 – 14.5 GHz	10.95 – 11.2 GHz
	11.2 – 11.45 GHz
	11.45 – 11.7 GHz
	11.7 – 12.2 GHz
Ka-band Uplink	**Ka-band Downlink**
27.5 – 29.1 GHz[1]	17.8 – 18.3 GHz
29.3 – 30.0 GHz	18.3 – 18.8 GHz
	18.8 – 19.3 GHz
	19.3 – 19.4 GHz
	19.6 – 19.7 GHz
	19.7 – 20.2 GHz

The EUTELSAT 133WB satellite creates 65 spot beams for each of the Ku-band uplink, Ku-band downlink, Ka-band uplink, and Ka-band downlink, providing the following coverage (illustrations of the beam coverage areas are provided in Exhibit 5):

Ku-band Uplink	65 spot beams	United States, Caribbean, Canada and North Pacific
Ku-band Downlink	65 spot beams	United States, Caribbean, Canada and North Pacific
Ka-band Uplink	65 spot beams	United States, Caribbean, Canada and North Pacific
Ka-band Downlink	65 spot beams	United States, Caribbean, Canada and North Pacific

[1] Note that the Application Narrative identifies and discusses individual sub-bands within the 27.5-29.1 GHz band.

4. Telemetry, Tracking and Control (TT&C)

As required by 25.172(a), this section describes how TT&C operations are designed for the EUTELSAT 133WB satellite. The TT&C sub-system provides for communications during on-station operations, as well as during spacecraft emergencies. Ku-band telecommand transmissions are normally received and Ku-band telemetry communications are normally transmitted by the spacecraft through a wide-beam antenna. During emergency operations, TT&C communications are transmitted and received through a near omni-directional antenna.

TT&C communication channels have been selected at the edge of the assigned Ku-band in accordance with Section 25.202(g). The satellite will utilize three Ku-band telemetry channels. The Ku-band telemetry channel center frequencies are 11450.5 MHz, 11451.1 MHz and 11699.4 MHz with a bandwidth of 300 kHz. The satellite will utilize two Ku-band command channels. The Ku-band command channel center frequencies are 13997.5 MHz and 13998.5 MHz with a bandwidth of 600 kHz.

The TT&C beams used for orbital maneuvers and on-station emergencies have gain contours that vary by less than 8 dB across the surface of the Earth. Accordingly, the gain at 8 dB below the peak falls beyond the edge of the Earth. Therefore, pursuant to Section 25.114(c)(4)(vi)(A) of the Commission's rules, contours for these beams are not required to be provided and the associated GXT files have not been included in Schedule S.

TT&C operations will be conducted from earth station facilities located in Mexico. Contact details for the control stations are provided below:

E133WB TT&C station 1:
Hermosillo
Carretera Bahía Kino, Km. 5.5
Col. El Llano
CP 83210
Hermosillo, Sonora
Mexico

E133WB TT&C station 2:
Iztapalapa
Av. de las Telecomunicaciones s/n
Col. Leyes de Reforma
CP 09310
Ciudad de México
Mexico

Satellite control center addresses and telephone numbers:

E133WB Control Center
Address: Eutelsat
70 rue Balard
75015 Paris
France

E133WB control responsible person: H. Schulze
Phone: fixed: / mobile: +33 1 5398 3466
24/7 hours number(s): +33 1 5398 3445

E133WB Operations Coordinator: P. Turner
Phone: +33 1 5398 3177

5. Uplink Power Control

The EUTELSAT 133WB design includes one Ka-band ULPC channel in a separate Earth-coverage beam. The Ka-band ULPC channel center frequency will be at 19699.9 MHz with a bandwidth of 0.1 kHz. It should be noted that Schedule S cannot reflect carrier bandwidth below 1 kHz so the value entered was rounded down to zero (0) by the Schedule S system.

The coverage patterns of the global Ku-band ULPC beacon beam will have gain contours that vary by less than 8 dB across the surface of the Earth, and accordingly the gain at 8 dB below the peak falls beyond the edge of the Earth. Therefore, pursuant to Section 25.114(c)(4)(vi)(A) of the Rules, contours for these beams are not required to be provided and the associated GXT files have not been included in Schedule S.

6. Frequency Plan

6.1 Ku-Band

The following tables provide the uplink and downlink Ku-band channel plan for EUTELSAT 133WB. This information is also provided in the accompanying Schedule S but is included here for clarity.

Table 1 Ku-Band Downlink Frequency Plan

Channel ID	Bandwidth (kHz)	Center Frequency (MHz)	Polarization
UD1	119000	10762.5	H, V
UD2	119000	10887.5	H, V
UD3	119000	11012.5	H, V
UD4	119000	11137.5	H, V
UD5	119000	11262.5	H, V
UD6	119000	11387.5	H, V
UD7	119000	11512.5	H, V

UD8	119000	11637.5	H, V
UD9	119000	11762.5	H, V
UD10	119000	11887.5	H, V
UD11	119000	12012.5	H, V
UD12	119000	12137.5	H, V
TM1	300	11450.5	H
TM2	300	11451.1	H
TM3	300	11699.4	V

Table 2 Ku-Band Uplink Frequency Plan

Channel ID	Bandwidth (kHz)	Center Frequency (MHz)	Polarization
UU1	119000	13812.5	H, V
UU2	119000	13937.5	H, V
UU3	119000	14062.5	H, V
UU4	119000	14187.5	H, V
UU5	119000	14312.5	H, V
UU6	119000	14437.5	H, V
TC1	600	13997.5	H
TC2	600	13998.5	H

6.2 Ka-Band

The following tables provide the uplink and downlink Ka-band channel plan for EUTELSAT 133WB. This information is also provided in the accompanying Schedule S but is included here for clarity.

Table 3 Ka-Band Downlink Frequency Plan

Channel ID	Bandwidth (kHz)	Center Frequency (MHz)	Polarization
AD1	119000	17862.5	L, R
AD2	119000	17987.5	L, R
AD3	119000	18112.5	L, R
AD4	119000	18237.5	L, R
AD5	119000	18362.5	L, R
AD6	119000	18487.5	L, R
AD7	119000	18612.5	L, R
AD8	119000	18737.5	L, R
AD9	119000	18862.5	L, R
AD10	119000	18987.5	L, R

AD11	119000	19112.5	L, R
AD12	119000	19237.5	L, R
AD13	94000	19350	L, R
AD14	94000	19650	L, R
AD15	119000	19762.5	L, R
AD16	119000	19887.5	L, R
AD17	119000	20012.5	L, R
AD18	119000	20137.5	L, R
BA	0.1	19699.9	H

Table 4 Ka-Band Uplink Frequency Plan

Channel ID	Bandwidth (kHz)	Center Frequency (MHz)	Polarization
AU1	119000	27562.5	L, R
AU2	119000	27687.5	L, R
AU3	119000	27812.5	L, R
AU4	119000	27937.5	L, R
AU5	119000	28062.5	L, R
AU6	119000	28187.5	L, R
AU7	119000	28312.5	L, R
AU8	119000	28437.5	L, R
AU9	119000	28562.5	L, R
AU10	119000	28687.5	L, R
AU11	119000	28812.5	L, R
AU12	119000	28937.5	L, R
AU13	94000	29050	L, R
AU14	119000	29362.5	L, R
AU15	119000	29487.5	L, R
AU16	119000	29612.5	L, R
AU17	119000	29737.5	L, R
AU18	194000	29900	L, R

7. Frequency Tolerance

The frequency tolerance requirements of Section 25.202(e) that the carrier frequency of each space station transmitter be maintained within 0.002% of the reference frequency will be met by the EUTELSAT 133WB satellite.

8. Out of Band Emissions

The out-of-band emission limits of Section 25.202(f)(1), (2) and (3) will be met by the EUTELSAT 133WB satellite.

9. Frequency Reuse

EUTELSAT 133WB will employ full frequency reuse on the Ku-band uplink and downlink by employing dual orthogonal linear polarization and frequency reuse across multiple spot beams.

EUTELSAT 133WB will employ full frequency reuse on the Ka-band uplink and downlink by employing dual orthogonal circular polarization and frequency reuse across multiple spot beams.

10. Cessation of Emissions

All EUTELSAT 133WB downlink transmissions can be turned on and off by ground telecommand, thereby causing cessation of emissions from the satellite, as required by Section 25.207 of the FCC's rules.

11. ITU Filings

EUTELSAT 133WB will operate in the Ku-band (10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz, 13.75-14.0 GHz and 14.0-14.5 GHz) and the Ka-band (17.8-18.3 GHz, 18.3-18.8 GHz, 18.8-19.3 GHz, 19.3-19.4 GHz, 19.6-19.7 GHz, 19.7-20.2 GHz, 27.5-29.1 GHz and 29.3-30.0 GHz) at the 133° W.L. nominal orbital location under the F-SAT-N4-133W and F-SAT-N5-133W ITU satellite network filings.[2] EUTELSAT 133WB will operate in the AP30B Ku-bands (10.7-10.95 and 11.2-11.45 GHz) at the 133° W.L. orbital location under the F-SAT-E-30B-133W ITU satellite network filing.

12. PFD Analysis

The power flux density ("PFD") limits for space stations operating in the 10950-11200 MHz, 11450-11700 MHz and 17700-19700 MHz are specified in Section 25.208 of the Commission's rules. Also, Section 25.138(a)(6) of the Commission's rules specify a PFD limit of -118 dBW/m2/MHz for space stations operating in the 18300-18800 MHz and 19700-20200 MHz bands.

The Commission's rules do not specify a PFD limit in the 10700-10950 MHz and 11200-11450 MHz bands; however, there are PFD limits specified in rule No. 21.16 of the International Telecommunication Union ("ITU") Radio Regulations. Neither the Commission's rules nor the ITU Radio Regulations specify any PFD limits for the 11700-12200 MHz band applicable to geostationary satellites operating in the FSS.

The maximum PFD levels for the EUTELSAT 133WB transmissions were calculated for the bands 10700-10950 MHz, 10950-11200 MHz, 11200-11450 MHz, 11450-11700 MHz, 17800-18300 MHz, 18300-18800 MHz, 18800-19300 MHz, 19300-19400 MHz, 19600-19700 MHz and 19700-20200 MHz. The results are provided in Schedule S and show that the downlink power flux density levels of the satellite carriers do

[2] It is possible that the EUTELSAT 133WB satellite may not be brought into use prior to the expiration date of the F-SAT-N4-133W filing. However, the EUTELSAT 133WA satellite (which EUTELSAT 133WB is intended to replace) will bring many of the relevant Ku-band frequencies into use. In addition, all relevant frequency bands of the FSAT-N4-133W filing are also covered by the F-SAT-N5-133W filing, which will still be valid when the EUTELSAT 133WB satellite is brought into use.

not exceed the limits specified in Section 25.208 of the Commission's rules, and those in No. 21.16 of the ITU Radio Regulations, as applicable.

13. Link Budgets

Link analysis for the satellite was conducted for representative carriers in the Ku-band and Ka-band spot beams. Two separate sets of link budgets were calculated to demonstrate anticipated nominal interference conditions and worst-case interference conditions. For the Ku-band links, it was assumed that the nearest satellite to EUTELSAT 133WB was AMC-1 operating at 130.9° W.L. and AMC-4 operating at 134.9° W.L. These satellites were assumed to be operating at the maximum downlink EIRP densities defined in Section 25.140 and the maximum uplink EIRP density envelopes defined in Section 25.218.

For the Ka-band links, in the worst-case adjacent satellite interference scenario, it was assumed that the nearest satellite to EUTELSAT 133WB was a hypothetical satellite operating at 130.85° W.L. and a hypothetical satellite operating at 134.85° W.L. For the nominal interference scenario, the only interfering Ka-band satellite assumed was SES-15 at 129.15 W.L. All Ka-band satellites were assumed to be operating at the maximum downlink EIRP densities defined in Section 25.140 and the maximum uplink EIRP density envelopes defined in Section 25.138(a).

The following assumptions were used in the link budget analysis:

- The link budgets are for clear sky operation.
- The clear sky link margins were chosen to provide sufficient link availability for the service(s).
- All transmitting and receiving earth stations have a cross-polarization isolation value of at least 27 dB within their main beam lobe.

The results of the link analysis with nominal interference conditions are shown in Exhibit 2. For these links, only the interference from AMC-1, AMC-4 and SES-15 was considered. The results of the link analysis with worst-case interference conditions are shown in Exhibit 1. For these links, the interference from AMC-1 and AMC-4 is considered in all applicable Ku-band frequencies. Furthermore, hypothetical Ka-band satellites were placed two-degrees away on either side of EUTELSAT 133WB.

In both sets of link budgets, the uplink and downlink power levels stayed constant and only the coding and modulation of the waveform was modified to take advantage of reduced adjacent satellite interference. This approach demonstrates the plan to use adaptive coding and modulation (ACM) to compensate for both rain fading and changes in the external interference environment.

14. Interference Analysis

In this section, the information specified in Section 25.140(a) is presented (as required by Section 25.114(d)(7)).

The downlink EIRP density of the satellite transmissions in the conventional or extended Ku-bands will not exceed levels provided in Section 25.140(a)(3)(ii), and associated uplink transmissions will not exceed applicable EIRP density envelopes in Sections 25.218, 25.222(a)(1), 25.226(a)(1) or 25.227(a)(1) unless the non-routine uplink and/or downlink operation is coordinated with operators of authorized co-frequency space stations at assigned locations within six degrees of EUTELSAT 133WB at 132.85° W.L.

The satellite will operate 1.95° away from the AMC-1 satellite. These two satellites have spectrum overlap in the Ku-band downlink from 11.7-12.2 GHz and in the Ku-band uplink from 14.0-14.5 GHz. To evaluate the implication of operating at a spacing of slightly less than two degrees on the uplink, the EIRP density envelopes in Sections 25.218, 25.222(a)(1), 25.226(a)(1) and 25.227(a)(1) were evaluated. In all cases, the critical part of the EIRP density envelope is described by: $15 – 25*\log_{10}(\theta)$ dBW/4 kHz for angular separations from 1.7° to 6° off boresight.

An analysis of the sidelobe isolation at 2° vs. 1.95° demonstrates that the difference is only 0.32 dB. Therefore, Eutelsat plans to only operate with earth stations that can meet a more stringent EIRP density envelope as defined by: $15 – 0.32 – 25*\log_{10}(\theta)$ dBW/4 kHz, unless the non-routine uplink operation is coordinated with operators of authorized co-frequency space stations at assigned locations within 6° of the satellite as defined by Section 25.140(a)(3)(ii).

Similarly, to evaluate the implication of operating at a spacing of slightly less than two degrees on the downlink, the receive antenna sidelobe isolation masks described in Section 25.209(a)(1) were evaluated. The critical sidelobe levels for two-degree spacing are defined by the equation: $29 – 25*\log_{10}(\theta)$ dBW/4 kHz for angular separations from 1.5 to 7 degrees off boresight. An analysis of the sidelobe isolation at 2° vs. 1.95° demonstrates that the difference is only 0.32 dB. Therefore, Eutelsat plans to operate the conventional Ku-band downlinks at 0.32 dB below the 14 dBW/4 kHz level defined by Section 25.140(a)(3)(ii), unless the non-routine downlink operation is coordinated with operators of authorized co-frequency space stations at assigned locations within 6° of EUTELSAT 133WB at 132.85° W.L.

EUTELSAT E133WB downlink transmissions in the conventional Ka-band will not generate power flux-density at the Earth's surface in excess of the levels provided in Section 25.140(a)(3)(iii), and associated uplink operation will not exceed applicable EIRP density envelopes in Section 25.138(a) unless the non-routine uplink and/or downlink operation is coordinated with operators of authorized co-frequency space stations at assigned locations within six degrees of EUTELSAT 133WB at 132.85° W.L.

Per Section 25.140 (a)(3)(iv), operations in the 10700 – 10950 MHz and 11200 – 11450 MHz bands will take into account the applicable requirements of Appendix 30B of the ITU's Radio Regulations. There are no United States Appendix 30B ITU filings within 6° of 132.85 W.L., and therefore there are no compatibility issues with EUTELSAT E133WB operations under Appendix 30B with respect to United States ITU Appendix 30B filings.

14.1 Adjacent Satellite Link Analysis (Section 25.140(a)(3)(v))

The EUTELSAT 133WB satellite will operate in bands 17800-18300 MHz, 18800-19400MHz and 19600-19700 MHz, addressed by Section 25.140(a)(3)(v). Since there are no commercial Ka-band satellites operating within two degrees of EUTELSAT 133WB, the impact of those operations on hypothetical satellites having the same operating characteristics as EUTELSAT 133WB located at 130.85° W.L and 134.85° W.L was analyzed. The satellite at 130.85° W.L. was assumed to have two adjacent satellites separated by two degrees: EUTELSAT 133WB at 132.85° W.L. and a hypothetical satellite having the same operating characteristics as EUTELSAT 133WB located at 128.85° W.L. The satellite at 134.85° W.L. was assumed to have two adjacent satellites separated by two degrees: EUTELSAT 133WB at 132.85°

W.L. and a hypothetical satellite having the same operating characteristics as EUTELSAT 133WB located at 136.85° W.L.

It should be noted that SES-15 operates in Ka-band at 129.15 W.L. As a result, it would not make sense to place a neighboring satellite at 130.85° W.L. A more realistic scenario would be SES-15 operating at 129.15 W.L. receiving interference from EUTELSAT 133WB at 132.85° W.L. and a hypothetical satellite at 127.15 W.L. However, the provided results demonstrate the EUTELSAT 133WB can operate in worst-case scenarios.

The link interference analysis demonstrating compatibility of EUTELSAT 133WB with these hypothetical satellite systems was performed for representative carriers. Other assumptions used in the analysis were as follows:

- The transmitting and receiving Ka-band earth station antennas have off-axis co-polar gains that are compliant with the limits specified in Section 25.209(a) of the FCC's rules.
- The Adjacent Satellite Interference (ASI) is computed based on EIRP densities.
- The uplink RF power density for each adjacent satellite is based on the maximum allowed for 2-degree spacing in that frequency band.
- The downlink EIRP density for each adjacent satellite is based on the maximum allowed for 2-degree spacing in that frequency band.

The results of the Ka-band two-degree spacing interference analysis are shown in Exhibit 3 (for a hypothetical satellite at 130.85° W.L.) and Exhibit 4 (for a hypothetical satellite at 134.85° W.L.) and demonstrate that the operation of EUTELSAT 133WB will permit the intended services for hypothetical satellites in slots 2° away while maintaining sufficient link margin.

15. Sharing with NGSO FSS in the 28.6-29.1 GHz and 18.8-19.3 GHz Band

Under the FCC's band plan, the 28.6-29.1 GHz band is allocated to NGSO FSS on a primary basis and to the GSO FSS on a secondary basis. Stations operating as a secondary service cannot cause harmful inference, nor seek interference protection from, co-frequency stations of a primary service. EUTELSAT 133WB's operations in the United States in this band will be consistent with the obligations of a secondary user.

Under the FCC's recently updated band plan, per FCC Report and Order 17-122, the 18.8-19.3 GHz band is available on a primary basis to NGSO FSS and on a secondary basis to GSO FSS. Operations with EUTELSAT 133WB will not cause harmful interference to nor seek protection from authorized NGSO operations in this band.

The Commission has authorized WorldVu Satellite's OneWeb system (which has not yet been launched) and the O3b system (which is in orbit and operating) to serve the U.S. market in the foregoing bands. With respect to OneWeb, Eutelsat has commenced discussions to coordinate the use of Ka-band frequencies between the OneWeb system and the entire Eutelsat satellite fleet. Eutelsat is confident that these discussions will result in a coordination agreement that includes EUTELSAT 133WB access to the 18.8-19.3 GHz and 28.6-29.1 GHz bands.

With respect to O3b, the following analysis demonstrates compatibility with NGSO FSS operations in these band segments. The O3b constellation consists of 12 satellites in a medium-Earth orbit with an altitude of 8062 km and an inclination of 0° (an equatorial orbit). The O3b satellites use steerable gateway spot beams which are oriented towards the gateways as the satellite traverses its orbit until the angle of arrival at the gateway falls below a minimum. An interference analysis is shown below which indicates that the EUTELSAT 133WB network and O3b system can operate without causing harmful interference into each other.

To evaluate the impact of interference from EUTELSAT 133WB into O3b and vice versa, it was necessary to compute the worst case angular separation (the smallest angle between the Eutelsat satellite and any of the satellites of the O3b constellation from earth stations at each of the beam pointing locations. A conservative assumption that simplifies the analysis was made that earth stations communicating with O3b and EUTELSAT 133WB are collocated. An analysis of all of the beams was conducted using the assumption that O3b earth stations would communicate with the O3b satellite that provides the highest elevation angle. This analysis produced a minimum angular separation of 12.36° between EUTELSAT 133WB and any O3b satellite. Other system parameters used in analysis are based on those in this Engineering Statement for EUTELSAT 133WB and for the publicly available FCC filings from O3b.

The details of the calculations are shown in Table 5, which indicate that the operation of the EUTELSAT 133WB system and a corresponding gateway earth station in the bands 28.6-29.1 GHz and 18.8-19.3 GHz will have a negligible impact on the O3b satellite network. Specifically, from Table 5 it can be seen that the calculated $\Delta T/T$ values are all below 6%, with a maximum $\Delta T/T$ value of 2.7% interference into O3B.

Table 5 Interference Analysis between EUTELSAT 133WB and O3B for the Worst Case Beam of E133WB.

Victim Network		O3b	133WB
Interfering Network		133WB	O3b
Victim ES Latitude	deg	23.5	23.5
Victim ES Longitude	deg	-143.7	-143.7
Uplink			
Frequency	GHz	28.7	28.7
Worst Case Angular Separation	deg	12.4	12.4
Interfering ES off-axis TX EIRP Density (25.138)	dB(W/Hz)	-48.8	-48.8
Slant Range (interfering path)	km	9457.8	37222.0
Free Space Loss (interfering path)	dB	201.1	213.0
Victim Satellite RX Peak Antenna Gain		34.5	49
Victim Satellite RX System Noise Temperature	K	1000	631.0
N_0	dB(W/Hz)	-198.6	-200.6
I_0	dB(W/Hz)	-215.4	-212.8
I_0/N_0	dB	-16.8	-12.2
$\Delta T/T$	%	2.1	6.0
Downlink			
Frequency	GHz	18.9	18.9
Interfering Satellite DL EIRP Density	dB(W/Hz)	-16	-28.3
Slant Range (interfering path)	km	37222.0	9457.8
Free Space Loss (interfering path)	dB	209.4	197.5
Worst Case Angular Separation	deg	12.4	12.4
Victim ES off-axis RX Gain (25.209)	dB	4.7	4.7
Victim ES RX System Noise Temperature	K	230	300
N_0	dB(W/Hz)	-205.0	-203.8
I_0	dB(W/Hz)	-220.7	-221.1
I_0/N_0	dB	-15.7	-17.3
$\Delta T/T$	%	2.7	1.9

The Commission has more recently authorized Telesat Canada's NGSO system (which has not been launched) to serve the U.S. market in the foregoing Ka-bands. Furthermore, several additional Ka-band NGSO systems have submitted filings as part of the Ku-band/Ka-band processing round initiated by the OneWeb filing. Eutelsat plans to coordinate with these NGSO operators, as applicable.

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this Application, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this Application and that it is complete and accurate to the best of my knowledge and belief.

/s/

_____

David C Morse, Ph.D.
Avaliant, LLC
Bellevue, WA USA
(425) 246-3080

Exhibit 1: EUTELSAT 133WB Link Budgets – Worst Case Interference

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	Link 1FWM	*Link 2FWA*	*Link3RTA*	*Link 4RTM*	*Link RT KAKA*	*Link FW KAKA*	*Link Return KUKU*	*Link FW KUKU*
SPACE SEGMENT								
Satellite	E133WB	E133WB	E133WB	E133WB	E133WB	E133WB	E133WB	E133WB
Orbital Position	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85
Transponder								
Bandwidth (MHz)	119	119	119	119	119	119	119	119
Uplink frequency (MHz)	28062.5	28062.5	14062.5	14062.5	29562.5	28062.5	14062.5	14062.5
Downlink frequency (MHz)	12012.5	12012.5	18612.5	18612.5	18612.5	18612.5	12062.5	12062.5
Uplink Coverage	KA	KA	KU	KU	KA	KA	KU	KU
Downlink Coverage	KU	KU	KA	KA	KA	KA	KU	KU
IPFD setting (dBW/m²)	-80	-80	-77	-77	-80	-80	-77	-70
IBO Multicarrier (dB)	5	5	7	7	5	5	7	5
OBO Multicarrier (dB)	3	3	4.5	4.5	3	3	4.5	3
CARRIER PARAMETERS								
Modulation	4 PSK	2 PSK	4 PSK	4 PSK	4 PSK	4 PSK	4 PSK	4 PSK
FEC	3/4	1/5	1/2	3/4	3/4	3/4	3/4	3/4
Spreading Factor	1	1	1	1	1	1	1	1
Roll Off (%)	20	20	20	20	20	20	20	20
Spectral efficiency (bps)	1.45	0.2	1	1.5	1.5	1.45	1.5	1.45
Reed Solomon (n/k)	1	1	1	1	1	1	1	1
Symbol rate (Mbaud)	100	100	3.333	3.333	3.333	100	3.333	100
Usefull Bit rate (Mbps)	145.208	20	3.333	5	5	145.208	5	145.208
Overall Bit rate (Mbps)	145.208	20	3.333	5	5	145.208	5	145.208
E_b/N_0 (dB)	3	1	2.5	4.7	4.7	3	4.7	3
E_s/N_0 (dB)	4.62	-5.99	2.5	6.46	6.46	4.62	6.46	4.62
CARRIER RESOURCES								
Transponder mode	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear
IBO with rain (dB)	5	5	26.	26.	19.73	5	26.	5
OBO with rain (dB)	3	3	23.5	23.5	17.73	3	23.5	3
Bandwidth consumption (MHz)	120	120	4	4	4	120	4	120
Power consumption (MHz)	119	119	1.497	1.497	4.	119	1.497	119
IPFD carrier (dBW/m²)	-94.79	-94.79	-119.	-113.15	-116.95	-94.79	-113.15	-86.92
GROUND SEGMENT - UPLINK								
Earth Station Code	Other	Other	Other	Other	Other	Other	Other	Other
Country	USA	USA	USA	USA	USA	USA	USA	USA
Location	Denver	Denver	Anchorage	Anchorage	Anchorage	Denver	Anchorage	Denver
Longitude (°)	-105.02	-105.02	-149.88	-149.88	-149.88	-105.02	-149.88	-105.02
Latitude (°)	39.72	39.72	61.22	61.22	61.22	39.72	61.22	39.72
Distance (km)	38120.14	38120.14	39627.83	39627.5	39627.5	38120.14	39627.5	38120.14
satellite G/T towards transmit station (dB/K)	20	20	16	16	16	20	16	19
Elevation angle (°)	35.82	35.82	19.2	19.2	19.2	35.82	19.2	35.82
Azimuth angle (°)	219.57	219.57	160.73	160.73	160.73	219.57	160.73	219.57
Antenna size (m)	9	9	0.45	1.2	0.75	9	1.2	4.5
Atmospheric losses (dB)	1	1	0.1	0.2	1	1	0.2	0.3
Uplink EIRP (dBW)	68.82	68.82	44.05	50	47	68.82	50	76
Post PA losses (dB)	4	4	1.5	1.5	1.5	4	1.5	4
Operating HPA Power (clear sky) (W)	2.11	2.11	11.2	6.2	1.8	2.11	6.2	175.58
HPA Rating (W)	13.33	13.33	12.57	6.96	2.02	13.33	6.96	350.33
GROUND SEGMENT - DOWNLINK								
Earth Station	Other	Other	Other	Other	Other	Other	Other	Other
Country	USA	USA	USA	USA	USA	USA	USA	USA
Location	Anchorage	Anchorage	Denver	Denver	Denver	Anchorage	Denver	Anchorage
Longitude (°)	-149.88	-149.88	-105.02	-105.02	-105.02	-149.88	-105.02	-149.88
Latitude (°)	61.22	61.2	39.72	39.72	39.72	61.22	39.72	61.22
Distance (km)	39627.5	39625.86	38120.14	38120.14	38120.14	39627.5	38120.14	39627.5
Antenna G/T towards satellite (dB/K)	20.57	12.5	40.84	40.84	40.84	20.75	31.61	20.6
Elevation angle (°)	19.2	19.22	35.82	35.82	35.82	19.2	35.82	19.2
Azimuth angle (°)	160.73	160.73	219.57	251.68	219.57	160.73	251.68	160.73
Antenna size (m)	1.2	0.45	9	9	9	0.75	4.5	1.2
Atmospheric Losses (dB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Satellite EIRP towards receive station (dBW)	58	58	50	50	50	63	55	58
System temperature (K)	130	117	165	165	165	117	145	130
Beam peak (dBW/Hz)	-22	-22	-35.73	-35.73	-28.96	-16	-30.73	-22
RESULTS								
Uplink Path Length (km)	38120.14	38120.14	39627.83	39627.5	39627.5	38120.14	39627.5	38120.14
Thermal Uplink C/N (dB)	23.4	23.4	15.96	21.81	11.55	23.4	21.81	36.27
Aggregated C/I Uplink (dB)	17.47	17.47	4.27	9.35	13.09	17.53	9.35	17.7
Uplink Propagation Losses (dB)	213.03	213.03	207.36	207.36	213.82	213.03	207.36	207.03
Downlink Path Length (km)	39627.5	39625.86	38120.14	38120.14	38120.14	39627.5	38120.14	39627.5
Thermal Downlink C/N (dB)	17.87	9.81	20.94	20.94	26.71	19.25	20.48	17.87
Aggregated C/I Downlink (dB)	10.88	-1.92	15.52	15.52	12.64	10.58	14.28	10.89
Downlink Propagation Losses (dB)	205.99	205.99	209.46	209.46	209.46	209.8	205.69	206.03
C/N+I Overall (dB)	9.19	-2.27	3.61	7.99	7.55	9.15	7.72	9.39
E_b/N_0 Overall (dB)	7.57	4.72	3.61	6.23	5.79	7.53	5.96	7.77
Clear Sky Link Margin (dB)	4.57	3.72	1.11	1.53	1.09	4.53	1.26	4.77
SUMMARY								
Bandwidth (MHz)	120	120	4	4	4	120	4	120
Power Equivalent Bandwidth (MHz)	119	119	1.497	1.497	4.	119	1.497	119

Exhibit 2: EUTELSAT 133WB Link Budgets – Nominal Interference

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	Link 1FWM	*Link 2FWA*	*Link3RTA*	*Link 4RTM*	*Link RT KAKA*	*Link FW KAKA*	*Link Return*	*Link FW KUKU*
SPACE SEGMENT								
Satellite	E133WB	E133WB	E133WB	E133WB	E133WB	E133WB	E133WB	E133WB
Orbital Position	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85
Transponder								
Bandwidth (MHz)	119	119	119	119	119	119	119	119
Uplink frequency (MHz)	28062.5	28062.5	14062.5	14062.5	29562.5	28062.5	14062.5	13812.5
Downlink frequency (MHz)	11512.5	11512.5	18612.5	18612.5	18612.5	18612.5	11512.5	11512.5
Uplink Coverage	KA	KA	KU	KU	KA	KA	KU	KU
Downlink Coverage	KU	KU	KA	KA	KA	KA	KU	KU
IPFD setting (dBW/m²)	-80	-80	-77	-77	-80	-80	-77	-70
IBO Multicarrier (dB)	5	5	7	7	5	5	7	5
OBO Multicarrier (dB)	3	3	4.5	4.5	3	3	4.5	3
CARRIER PARAMETERS								
Modulation	4 PSK	4 PSK	4 PSK	4 PSK	4 PSK	4 PSK	4 PSK	4 PSK
FEC	4/5	3/5	1/2	3/4	3/4	5/6	3/4	4/5
Spreading Factor	1	1	1	1	1	1	1	1
Roll Off (%)	20	20	20	20	20	20	20	20
Spectral efficiency (bps)	1.55	1.16	1	1.5	1.5	1.62	1.5	1.55
Reed Solomon (n/k)	1	1	1	1	1	1	1	1
Symbol rate (Mbaud)	100	100	3.333	3.333	3.333	100	3.333	100
Usefull Bit rate (Mbps)	154.943	116.003	3.333	5	5	161.529	5	154.943
Overall Bit rate (Mbps)	154.943	116.003	3.333	5	5	161.529	5	154.943
E_b/N_0 (dB)	3.4	2.2	2.5	4.7	4.7	3.7	4.7	3.4
E_s/N_0 (dB)	5.3	2.84	2.5	6.46	6.46	5.78	6.46	5.3
CARRIER RESOURCES								
Transponder mode	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear
IBO with rain (dB)	5	5	26.	26.	19.73	5	26.	5
OBO with rain (dB)	3	3	23.5	23.5	17.73	3	23.5	3
Bandwidth consumption (MHz)	120	120	4	4	4	120	4	120
Power consumption (MHz)	119	119	1.497	1.497	4.	119	1.497	119
IPFD carrier (dBW/m²)	-94.79	-94.79	-119.	-113.15	-116.95	-94.79	-113.15	-86.92
GROUND SEGMENT - UPLINK								
Earth Station Code	Other	Other	Other	Other	Other	Other	Other	Other
Country	USA	USA	USA	USA	USA	USA	USA	USA
Location	Denver	Denver	Anchorage	Anchorage	Anchorage	Denver	Anchorage	Denver
Longitude (°)	-105.02	-105.02	-149.88	-149.88	-149.88	-105.02	-149.88	-105.02
Latitude (°)	39.72	39.72	61.22	61.22	61.22	39.72	61.22	39.72
Distance (km)	38120.14	38120.14	39627.83	39627.5	39627.5	38120.14	39627.5	38120.14
satellite G/T towards transmit station (dB/K)	20	20	16	16	16	20	16	19
Elevation angle (°)	35.82	35.82	19.2	19.2	19.2	35.82	19.2	35.82
Azimuth angle (°)	219.57	219.57	160.73	160.73	160.73	219.57	160.73	219.57
Antenna size (m)	9	9	0.45	1.2	0.75	9	1.2	4.5
Atmospheric losses (dB)	1	1	0.1	0.2	1	1	0.2	0.3
Uplink EIRP (dBW)	68.82	68.82	44.05	50	47	68.82	50	76
Post PA losses (dB)	4	4	1.5	1.5	1.5	4	1.5	4
Operating HPA Power (clear sky) (W)	2.11	2.11	11.2	6.2	1.8	2.11	6.2	182.
HPA Rating (W)	13.33	13.33	12.57	6.96	2.02	13.33	6.96	363.13
GROUND SEGMENT - DOWNLINK								
Earth Station	Other	Other	Other	Other	Other	Other	Other	Other
Country	USA	USA	USA	USA	USA	USA	USA	USA
Location	Anchorage	Anchorage	Denver	Denver	Denver	Anchorage	Denver	Anchorage
Longitude (°)	-149.88	-149.88	-105.02	-105.02	-105.02	-149.88	-105.02	-149.88
Latitude (°)	61.22	61.2	39.72	39.72	39.72	61.22	39.72	61.22
Distance (km)	39627.5	39625.86	38120.14	38120.14	38120.14	39627.5	38120.14	39627.5
Antenna G/T towards satellite (dB/K)	20.2	12.14	40.84	40.84	40.84	20.75	31.2	20.2
Elevation angle (°)	19.2	19.22	35.82	35.82	35.82	19.2	35.82	19.2
Azimuth angle (°)	160.73	160.73	219.57	251.68	219.57	160.73	251.68	160.73
Antenna size (m)	1.2	0.45	9	9	9	0.75	4.5	1.2
Atmospheric Losses (dB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Satellite EIRP towards receive station (dBW)	58	58	50	50	50	63	55	58
System temperature (K)	130	117	165	165	165	117	145	130
Beam peak (dBW/Hz)	-22	-22	-35.73	-35.73	-28.96	-16	-30.73	-22
RESULTS								
Uplink Path Length (km)	38120.14	38120.14	39627.83	39627.5	39627.5	38120.14	39627.5	38120.14
Thermal Uplink C/N (dB)	23.4	23.4	15.96	21.81	11.55	23.4	21.81	36.43
Aggregated C/I Uplink (dB)	19.7	19.66	4.27	9.35	18.53	19.68	9.35	17.7
Uplink Propagation Losses (dB)	213.03	213.03	207.36	207.36	213.82	213.03	207.36	206.87
Downlink Path Length (km)	39627.5	39625.86	38120.14	38120.14	38120.14	39627.5	38120.14	39627.5
Thermal Downlink C/N (dB)	17.87	9.81	20.94	20.94	26.71	19.25	20.48	17.87
Aggregated C/I Downlink (dB)	11.64	9.22	16.04	16.04	13.2	12.93	14.87	11.62
Downlink Propagation Losses (dB)	205.63	205.62	209.46	209.46	209.46	209.8	205.29	205.63
C/N+I Overall (dB)	9.99	6.21	3.64	8.07	8.73	11.07	7.84	9.9
E_b/N_0 Overall (dB)	8.09	5.56	3.64	6.31	6.97	8.99	6.08	7.99
Clear Sky Link Margin (dB)	4.69	3.36	1.14	1.61	2.27	5.29	1.38	4.59
SUMMARY								
Bandwidth (MHz)	120	120	4	4	4	120	4	120
Power Equivalent Bandwidth (MHz)	119	119	1.497	1.497	4.	119	1.497	119

Exhibit 3: 2-Degree Spacing Interference Analysis for Ka-band at 130.85° W.L.

	Units	*Link 1FWM*	*Link 2FWA*	*Link 3RTA*	*Link 4RTM*	*Link FW KAKA*	*Link RT KAKA*
UPLINK BEAM INFORMATION							
Uplink Beam Name		UAL1/UAR1	UAL1/UAR1	UUH2/UUV2	UUH2/UUV2	UAL1/UAR1	UAL1/UAR1
Uplink Frequency	GHz	28.0	28.0	14.1	14.1	28.1	28.1
Uplink Beam Polarization		CIRCULAR	CIRCULAR	LINEAR	LINEAR	CIRCULAR	CIRCULAR
Uplink Satellite G/T toward Earth Station	dB/K	20.0	20.0	16.0	16.0	20.0	16.0
DOWNLINK BEAM INFORMATION							
Downlink Beam Name		DUH4/DUV4	DUH4/DUV4	DAL1/DAR1	DAL1/DAR1	DAL1/DAR1	DAL1/DAR1
Downlink Frequency	GHz	11.5	11.5	18.1	18.1	18.1	18.1
Downlink Beam Polarization		LINEAR	LINEAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Satellite EIRP toward Earth Station	dBi	58.0	58.0	50.0	50.0	63.0	50.0
ADJACENT SATELLITE 1		Hypothetical -132.85° W.L.					
Satellite 1 Orbital Location	deg	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85
Uplink Power Density	dB(W/Hz)	-56.5	-56.5	-50.0	-50.0	-56.5	-56.5
Downlink EIRP Density	dB(W/Hz)	-22.0	-22.0	-16.0	-16.0	-16.0	-16.0
ADJACENT SATELLITE 2		Hypothetical -128.85° W.L.					
Satellite 2 Orbital Location	deg	-128.85	-128.85	-128.85	-128.85	-128.85	-128.85
Uplink Power Density	dB(W/Hz)	-56.5	-56.5	-50.0	-50.0	-56.5	-56.5
Downlink EIRP Density	dB(W/Hz)	-22.0	-22.0	-16.0	-16.0	-16.0	-16.0
CARRIER INFORMATION							
Carrier ID		Link 1FWM	Link 2FWA	Link 1FWM	Link 4RTM	Link FW KAKA	Link RT KAKA
Information Rate	kbps	145000	20000	3333	5000	145000	5000
Modulation		QPSK	BPSK	QPSK	QPSK	QPSK	QPSK
FEC Rate		0.73	0.20	0.50	0.75	0.73	0.75
Noise Bandwidth	kHz	100000.0	100000.0	3333.0	3333.0	100000.0	3333.0
Minimum C/N, Clear Sky	dB	4.9	-5.8	2.5	5.1	4.9	5.1
UPLINK EARTH STATION							
Earth Station Diameter	meters	9.0	9.0	0.5	1.2	9.0	0.8
Earth Station Gain	dBi	66.6	66.6	34.6	43.1	66.6	45.0
Earth Station Latitude	deg	39.7	39.7	61.2	61.2	39.7	61.2
Earth Station Longitude	deg	-105.0	-105.0	-149.9	-149.9	-105.0	-149.9
Earth Station Elevation Angle	deg	36.9	36.9	18.8	18.8	36.9	18.8
DOWNLINK EARTH STATION							
Earth Station Diameter	meters	1.2	0.45	9.0	9.0	0.75	9.0
Earth Station G/T	dB/K	20.15	12.09	40.6	40.6	20.51	40.6
Earth Station Latitude	deg	61.2	61.2	39.7	39.7	61.2	39.7
Earth Station Longitude	deg	-149.9	-149.9	-105.0	-105.0	-149.9	-105.0
Earth Station Elevation Angle	deg	18.8	18.9	36.9	36.9	18.8	36.9
UPLINK PERFORMANCE							
Uplink Earth Station EIRP	dBW	68.8	68.8	44.1	50.0	68.8	47.0
Uplink Free Space Loss	dB	213.0	213.0	207.4	207.4	213.0	213.4
Uplink Atmospheric Attenuation	dB	1	1	0.1	0.2	1	1
Satellite G/T	dB/K	20.0	20.0	16.0	16.0	20.0	16.0
Carrier Noise Bandwidth	dB-Hz	80.0	80.0	65.2	65.2	80.0	65.2
Uplink C/N	dB	23.4	23.4	15.9	21.8	23.4	12.0
DOWNLINK PERFORMANCE							
Downlink EIRP per Carrier	dBW	55.0	55.0	26.5	26.5	60.0	32.2
Downlink Free Space Loss	dB	205.6	205.6	209.2	209.2	209.6	209.2
Downlink Atmospheric Attenuation	dB	0.3	0.3	0.3	0.3	0.3	0.3
Earth Station G/T	dB/K	20.15	12.09	40.6	40.6	20.51	40.6
Carrier Noise Bandwidth	dB-Hz	80.0	80.0	65.2	65.2	80.0	65.2
Downlink C/N	dB	17.8	9.8	20.9	20.9	19.2	26.7
COMPOSITE LINK PERFORMANCE							
C/N Uplink	dB	23.4	23.4	15.9	21.8	23.4	12.0
C/N Downlink	dB	17.8	9.8	20.9	20.9	19.2	26.7
C/I Uplink	dB	23.8	17.5	21.2	21.2	21.2	21.2
C/I Downlink	dB	18.5	13.3	18.4	18.4	18.0	18.4
C/I Uplink Adjacent Satellite 1	dB	24.9	24.9	7.0	14.0	24.9	17.4
C/I Downlink Adjacent Satellite 1	dB	17.4	3.0	19.6	19.6	16.3	25.4
C/I Uplink Adjacent Satellite 2	dB	24.9	24.9	7.0	14.0	24.9	17.4
C/I Downlink Adjacent Satellite 2	dB	17.4	3.0	19.6	19.6	16.3	25.4
C/(N+I) Composite	dB	10.9	-0.7	3.2	8.6	10.3	8.9
Minimum Required C/N	dB	4.9	-5.8	2.5	5.1	4.9	5.1
Excess Clear Sky Link Margin	dB	6.0	5.1	0.7	3.4	5.4	3.8
CARRIER DENSITY LEVELS							
Uplink Power Density	dBW/Hz	-77.7	-77.7	-55.7	-58.3	-77.8	-63.2
Downlink EIRP Density	dBW/Hz	-25.0	-25.0	-38.8	-38.8	-20.0	-33.0

Exhibit 4: 2-Degree Spacing Interference Analysis for Ka-band at 134.85° W.L.

	Units	*Link 1FWM*	*Link 2FWA*	*Link 3RTA*	*Link 4RTM*	*Link FW KAKA*	*Link RT KAKA*
UPLINK BEAM INFORMATION							
Uplink Beam Name		UAL1/UAR1	UAL1/UAR1	UUH2/UUV2	UUH2/UUV2	UAL1/UAR1	UAL1/UAR1
Uplink Frequency	GHz	28.0	28.0	14.1	14.1	28.1	28.1
Uplink Beam Polarization		CIRCULAR	CIRCULAR	LINEAR	LINEAR	CIRCULAR	CIRCULAR
Uplink Satellite G/T toward Earth Station	dB/K	20.0	20.0	16.0	16.0	20.0	16.0
DOWNLINK BEAM INFORMATION							
Downlink Beam Name		DUH4/DUV4	DUH4/DUV4	DAL1/DAR1	DAL1/DAR1	DAL1/DAR1	DAL1/DAR1
Downlink Frequency	GHz	11.5	11.5	18.1	18.1	18.1	18.1
Downlink Beam Polarization		LINEAR	LINEAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Satellite EIRP toward Earth Station	dBi	58.0	58.0	50.0	50.0	63.0	50.0
ADJACENT SATELLITE 1		Hypothetical -136.85° W.L.					
Satellite 1 Orbital Location	deg	-136.85	-136.85	-136.85	-136.85	-136.85	-136.85
Uplink Power Density	dB(W/Hz)	-56.5	-56.5	-50.0	-50.0	-56.5	-56.5
Downlink EIRP Density	dB(W/Hz)	-22.0	-22.0	-16.0	-16.0	-16.0	-16.0
ADJACENT SATELLITE 2		Hypothetical -132.85° W.L.					
Satellite 2 Orbital Location	deg	-132.85	-132.85	-132.85	-132.85	-132.85	-132.85
Uplink Power Density	dB(W/Hz)	-56.5	-56.5	-50.0	-50.0	-56.5	-56.5
Downlink EIRP Density	dB(W/Hz)	-22.0	-22.0	-16.0	-16.0	-16.0	-16.0
CARRIER INFORMATION							
Carrier ID		Link 1FWM	Link 2FWA	Link 1FWM	Link 4RTM	Link FW KAKA	Link RT KAKA
Information Rate	kbps	145000	20000	3333	5000	145000	5000
Modulation		QPSK	BPSK	QPSK	QPSK	QPSK	QPSK
FEC Rate		0.73	0.20	0.50	0.75	0.73	0.75
Noise Bandwidth	kHz	100000.0	100000.0	3333.0	3333.0	100000.0	3333.0
Minimum C/N, Clear Sky	dB	4.9	-5.8	2.5	5.1	4.9	5.1
UPLINK EARTH STATION							
Earth Station Diameter	meters	9.0	9.0	0.5	1.2	9.0	0.8
Earth Station Gain	dBi	66.6	66.6	34.6	43.1	66.6	45.0
Earth Station Latitude	deg	39.7	39.7	61.2	61.2	39.7	61.2
Earth Station Longitude	deg	-105.0	-105.0	-149.9	-149.9	-105.0	-149.9
Earth Station Elevation Angle	deg	34.7	34.7	19.5	19.5	34.7	19.5
DOWNLINK EARTH STATION							
Earth Station Diameter	meters	1.2	0.45	9.0	9.0	0.75	9.0
Earth Station G/T	dB/K	20.15	12.09	40.6	40.6	20.51	40.6
Earth Station Latitude	deg	61.2	61.2	39.7	39.7	61.2	39.7
Earth Station Longitude	deg	-149.9	-149.9	-105.0	-105.0	-149.9	-105.0
Earth Station Elevation Angle	deg	19.5	19.5	34.7	34.7	19.5	34.7
UPLINK PERFORMANCE							
Uplink Earth Station EIRP	dBW	68.8	68.8	44.1	50.0	68.8	47.0
Uplink Free Space Loss	dB	213.0	213.0	207.4	207.4	213.1	213.4
Uplink Atmospheric Attenuation	dB	1	1	0.1	0.2	1	1
Satellite G/T	dB/K	20.0	20.0	16.0	16.0	20.0	16.0
Carrier Noise Bandwidth	dB-Hz	80.0	80.0	65.2	65.2	80.0	65.2
Uplink C/N	dB	23.4	23.4	16.0	21.8	23.4	12.0
DOWNLINK PERFORMANCE							
Downlink EIRP per Carrier	dBW	55.0	55.0	26.5	26.5	60.0	32.2
Downlink Free Space Loss	dB	205.6	205.6	209.3	209.3	209.6	209.3
Downlink Atmospheric Attenuation	dB	0.3	0.3	0.3	0.3	0.3	0.3
Earth Station G/T	dB/K	20.15	12.09	40.6	40.6	20.51	40.6
Carrier Noise Bandwidth	dB-Hz	80.0	80.0	65.2	65.2	80.0	65.2
Downlink C/N	dB	17.8	9.8	20.9	20.9	19.2	26.6
COMPOSITE LINK PERFORMANCE							
C/N Uplink	dB	23.4	23.4	16.0	21.8	23.4	12.0
C/N Downlink	dB	17.8	9.8	20.9	20.9	19.2	26.6
C/I Uplink	dB	23.8	17.5	21.2	21.2	21.2	21.2
C/I Downlink	dB	18.5	13.3	18.4	18.4	18.0	18.4
C/I Uplink Adjacent Satellite 1	dB	24.9	24.9	7.0	14.0	24.9	17.5
C/I Downlink Adjacent Satellite 1	dB	17.5	3.0	19.6	19.6	16.4	25.3
C/I Uplink Adjacent Satellite 2	dB	24.9	24.9	7.0	14.0	24.9	17.4
C/I Downlink Adjacent Satellite 2	dB	17.5	3.0	19.6	19.6	16.4	25.4
C/(N+I) Composite	dB	10.9	-0.7	3.2	8.6	10.3	8.9
Minimum Required C/N	dB	4.9	-5.8	2.5	5.1	4.9	5.1
Excess Clear Sky Link Margin	dB	6.0	5.1	0.7	3.4	5.4	3.8
CARRIER DENSITY LEVELS							
Uplink Power Density	dBW/Hz	-77.7	-77.7	-55.7	-58.3	-77.8	-63.2
Downlink EIRP Density	dBW/Hz	-25.0	-25.0	-38.8	-38.8	-20.0	-33.0

Exhibit 5: Service Areas

This document illustrates the service areas for the uplink and downlink beams in both Ku-band and Ka-band in the accompanying Schedule S.

The EUTELSAT 133WB satellite generates 65 spot beams for both uplink and downlink in both the Ku-band and the Ka-band. The beam pointing locations for each of the four sets of spot beams are identical, provided in Table 6, and result in the coverage area illustrated in Figure 1. Figure 1 reflects the service area for uplink beams UUH1, UUH2, UUV1, UUV2, UAL1, UAL2, UAR1, UAR2. Figure 1 reflects the service area for downlink beams DUH1, DUH2, DUH3, DUH4, DUH5, DUV1, DUV2, DUV3, DUV4, DUV5, DAL1, DAL2, DAL3, DAL4, DAL5, DAL6, DAR1, DAR2, DAR3, DAR4, DAR5 AND DAR6.

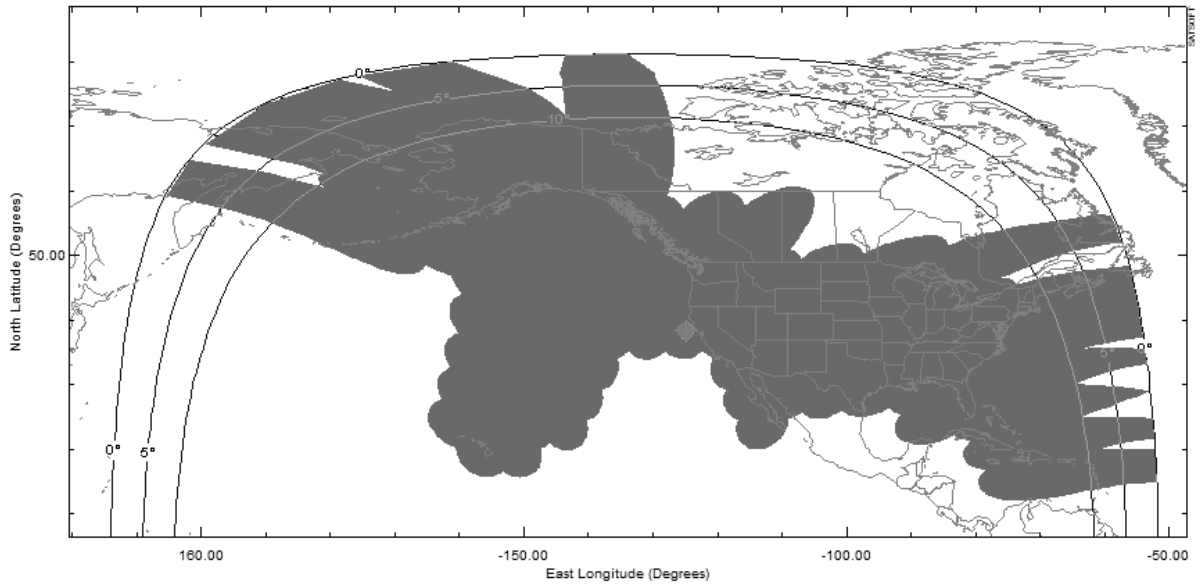

Figure 1 Ku-band and Ka-band Fixed Uplink and Downlink Service Area #1 from 132.85°W.L.

Table 6 Beam Pointing Locations for the Set of 65 Spot Beams

Ka-band Beam Pointing Locations

Beam Designation	Long °E	Lat °N
A1	-154.404	23.7309
A2	-148.954	23.6181
A3	-143.739	23.5425
A4	-75.1512	25.3954
A5	-152.585	28.3522
A6	-146.973	28.2233
A7	-141.584	28.1414
A8	-114.996	28.357
A9	-109.157	28.5387
A10	-102.843	28.7863
A11	-95.778	29.1222
A12	-87.4053	29.5937
A13	-76.1522	30.335
A14	-150.84	33.2912
A15	-144.97	33.1471
A16	-139.314	33.0643
A17	-116.817	33.2869
A18	-110.717	33.4953
A19	-104.124	33.7874
A20	-96.7312	34.1916
A21	-87.9064	34.77
A22	-75.7395	35.7102
A23	-155.799	38.9422
A24	-149.156	38.6903
A25	-142.888	38.5319
A26	-136.827	38.4549
A27	-130.842	38.4525
A28	-124.815	38.5246
A29	-118.622	38.6759
A30	-112.108	38.9159
A31	-105.052	39.2656
A32	-97.0721	39.7656
A33	-87.3363	40.5079
A34	-72.7682	41.835
A35	-154.872	45.0952
A36	-147.54	44.7911
A37	-140.637	44.6184

Ku-band Beam Pointing Locations

Beam Designation	Long °E	Lat °N
U1	-154.404	23.7309
U2	-148.954	23.6181
U3	-143.739	23.5425
U4	-75.1512	25.3954
U5	-152.585	28.3522
U6	-146.973	28.2233
U7	-141.584	28.1414
U8	-114.996	28.357
U9	-109.157	28.5387
U10	-102.843	28.7863
U11	-95.778	29.1222
U12	-87.4053	29.5937
U13	-76.1522	30.335
U14	-150.84	33.2912
U15	-144.97	33.1471
U16	-139.314	33.0643
U17	-116.817	33.2869
U18	-110.717	33.4953
U19	-104.124	33.7874
U20	-96.7312	34.1916
U21	-87.9064	34.77
U22	-75.7395	35.7102
U23	-155.799	38.9422
U24	-149.156	38.6903
U25	-142.888	38.5319
U26	-136.827	38.4549
U27	-130.842	38.4525
U28	-124.815	38.5246
U29	-118.622	38.6759
U30	-112.108	38.9159
U31	-105.052	39.2656
U32	-97.0721	39.7656
U33	-87.3363	40.5079
U34	-72.7682	41.835
U35	-154.872	45.0952
U36	-147.54	44.7911
U37	-140.637	44.6184

A38	-133.937	44.559	U38	-133.937	44.559
A39	-127.261	44.6064	U39	-127.261	44.6064
A40	-120.435	44.7654	U40	-120.435	44.7654
A41	-113.251	45.0482	U41	-113.251	45.0482
A42	-105.407	45.4868	U42	-105.407	45.4868
A43	-96.3445	46.1458	U43	-96.3445	46.1458
A44	-84.6355	47.2044	U44	-84.6355	47.2044
A45	-177.028	54.3456	U45	-177.028	54.3456
A46	-164.453	53.1674	U46	-164.453	53.1674
A47	-154.657	52.4867	U47	-154.657	52.4867
A48	-146.06	52.0879	U48	-146.06	52.0879
A49	-138.033	51.8963	U49	-138.033	51.8963
A50	-130.203	51.8833	U50	-130.203	51.8833
A51	-122.262	52.0457	U51	-122.262	52.0457
A52	-113.868	52.4047	U52	-113.868	52.4047
A53	-172.926	64.3159	U53	-172.926	64.3159
A54	-157.083	62.7279	U54	-157.083	62.7279
A55	-145.191	62.016	U55	-145.191	62.016
A56	-134.511	61.7795	U56	-134.511	61.7795
A57	-113.134	23.7448	U57	-113.134	23.7448
A58	-86.1828	24.7823	U58	-86.1828	24.7823
A59	-72.9988	20.7358	U59	-72.9988	20.7358
A60	-156.317	19.3331	U60	-156.317	19.3331
A61	-150.954	19.2389	U61	-150.954	19.2389
A62	-157.063	33.5065	U62	-157.063	33.5065
A63	-158.547	28.5373	U63	-158.547	28.5373
A64	-160.213	23.8878	U64	-160.213	23.8878
A65	-70.1748	16.0177	U65	-70.1748	16.0177

Eutelsat 133WB Space Debris Mitigation Plan (prepared for the Federal Communications Commission)

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ISSUE DATE: 19 January 2018

Prepared by:	*Position*	*Signature*	*Date*
D. Zamora	Head of Flight Dynamics		19/01/2018

Approved by:	*Position*	*Signature*	*Date*
L.R. Pattinson	Director of Satellite Operations		19/1/18

CHANGE RECORD

Date	*Issue/rev*	*Pages affected*	*Description*
19/01/2018	1/0	All	First issue.

TABLE OF CONTENTS

1. Introduction

This document describes the space debris mitigation plan that Eutelsat Communications S.A ("Eutelsat") shall apply to the EUTELSAT 133WB satellite at the 132.85° West Longitude (W.L.) orbital location.

Eutelsat 133WB will be manufactured according to space industry standards and specifications. The satellite will be 3-axis stabilized and will use electrical propulsion for initial orbit raising and on-station control.

EUTELSAT 133WB will be launched in June 2021 and the end of its operational life is not expected to be before mid-2036.

2. Related documents

2.1. Applicable Documents

1. EUTELSAT Space Debris Mitigation Plan. Issue 2.0. EUT_CTL_SAT_QMS_PLN_00021, 25 April 2017.
2. FCC. Orbital Debris Mitigation Standard Practices. FCC 04-130. June 21, 2004.

2.2. Reference Documents

1. European Code of Conduct for Space Debris Mitigation. Issue 1.0. 28 June 2004.
2. IADC Space Debris Mitigation Guidelines. IADC-02-01. Revision 1. September 2007.
3. Space Product Assurance. Safety. ECSS-Q-40A. 19 April 1996.
4. NASA Safety Standard. Guidelines and Assessment Procedures for limiting Orbital Debris. NSS 1740.14. Aug 1995.
5. ITU Environment Protection of the Geostationary Orbit. S.1003. 1993.
6. UNCOPUOS. Technical Report on Space Debris. 1999.

3. Eutelsat 133WB operations

The E133WB satellite will strictly comply with requirements in the French Space Operations Act, as well as prevailing international best practices and standards, to minimize space debris.

Eutelsat operational procedures and the E133WB satellite design will limit the amount of debris released during normal operations and the probability of the space station becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal.

Eutelsat will assess the amount of debris released in a planned manner and no intentional debris will be released during normal operations of the E133WB satellite. A safe operational configuration of the satellite will be ensured thanks to the hardware design and operational procedures.

Eutelsat minimizes the probability of the satellite becoming a source of debris by collisions with large debris or other operational satellites. Eutelsat assessed and determined that, other than the EUTELSAT 133WA satellite located at 132.85°W, there are no other satellites located at or sufficiently near EUTELSAT 133WB's planned orbital location that might result in overlap of satellite orbit control windows.

For the period when both the E133WA and E133WB satellites will be co-located at the 132.85°W orbit location, Eutelsat will coordinate their flight profiles internally to maintain adequate separation distances and ensure there is no possibility of collision.[1]

E133WB will be controlled within its orbit control window (132.85°W +/-0.1°) by standard routine periodic orbit correction maneuvers. In case of potential drift outside this window, correction maneuvers will be implemented to maintain satellite location within the window.

Eutelsat will assess the probability of accidental explosions during and after completion of mission operations. Thanks to design safety margins and enough safety barriers, the probability of occurrence of accidental explosion of the E133WB satellite will be negligible.

The satellite design, which includes electric propulsion for on-station control, will be such that high levels of thruster activity and orbit perturbation will not occur during normal operations.

4. Eutelsat 133WB End-of-Life Disposal

According to French Space Operations Act, IADC guidelines and best practices and standards, any geostationary satellite at end-of-life ("EOL") shall be disposed to an orbit that ensures that the satellite will not re-enter the geostationary orbit ("GEO") protected region (GEO height +/- 200 km) in the long term. The post-mission disposal activities have been planned as follows:

1. The orbit of the satellite will be raised by 300 km to ensure that the satellite will not re-enter the GEO protected region. 1.8 kg of Xenon have been allocated and reserved with a confidence level of 99.7% to carry out the post-mission disposal maneuvers. During the satellite lifetime, Eutelsat will routinely monitor the propellant remaining in the propellant tanks. The FCC will be informed of any significant change to the above quantity of propellant.

   The minimum perigee height to avoid re-entering into the GEO protected region can be computed using the IADC formula applied to this satellite:

$$\text{Delta\_H (km)} = 235 + 1000.(A/m)\text{eff} = 256 \text{ km}$$

[1] Eutelsat will apply a combined eccentricity and inclination vector separation method to ensure sufficient separation between the two satellites.

where the final term is the effective area/mass ratio of the satellite. Therefore, the planned 300 km above GEO height is sufficient to satisfy the 256 km requirement.

2. The satellite tracking, telemetry and control operations are planned to avoid interference and coordinated with potentially affected satellite networks.

3. As part of the EOL activities, E133WB energy sources will be rendered inactive such that debris generation will not result from the conversion or dissipation of energy sources onboard the satellite. For E133WB, this involves the following:

   - Discharge the batteries during EOL operations and isolate them from the solar arrays to prevent further electrical energy storage.
   - Switch off the momentum wheels.
   - Deplete and eventually vent the propellant tanks, which allows depressurizing during passivation operations and results in only negligible residuals remaining in the tanks.
   - All pyrotechnic systems will be fired at initial stage of life (TBC).

5. Notifications

EUTELSAT undertakes to provide the relevant bodies as required (UNCOPUOS, FCC, ITU, ANFR, etc.) with all appropriate notifications as required by law or regulations including but not limited to those concerning initial commencement of service, location, relocation, inclined orbit operations and EOL operations.