

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

In the Matter of	)	
	)	
	)	
<b>ECHOSTAR SATELLITE OPERATING L.L.C.</b>	)	
	)	
Application to Modify Blanket Earth Station	)	File No. SES-MFS-2008_____
License to (1) Add Ciel 2, a Canadian-licensed	)	Call Sign E050029
DBS Satellite at 129° W.L., as a Point of	)	
Communication, and (2) Increase the Number of	)	
Authorized Receive-only Earth Stations from	)	
1,000,000 to 5,000,000	)	
	)	

**MODIFICATION APPLICATION**

EchoStar Satellite Operating L.L.C. (“DISH Network”) hereby requests a modification of its blanket receive-only earth station authorization to: (1) add Ciel 2 – a new Canadian-licensed Direct Broadcast Satellite (“DBS”) satellite – as a point of communication at the nominal 129° W.L. orbital location; and (2) increase the number of authorized receive-only earth stations from 1,000,000 to 5,000,000.<sup>1</sup> Upon successful launch, Ciel 2 will replace the EchoStar 5 satellite, which is currently operating at that location under an Industry Canada license issued to Ciel Satellite Limited Partnership, as assignee of Ciel Satellite Communications, Inc. (together,

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<sup>1</sup> DISH Network is also requesting authority to provide service to somewhat smaller dishes (as small as 45 cm in diameter, *see* Schedule B), as well as a partial waiver of the processing fees payable for this application (*see Attachment A*). In addition to this application, DISH Network’s sister company, EchoStar Corporation (“EchoStar”), is separately applying to modify a number of its DBS feeder link earth station licenses (Call Signs E950288, E970394 and E980178) to enable DISH Network to uplink programming to the Ciel 2 satellite and to make other minor modifications. EchoStar is also applying for a number of new feeder link earth station licenses to enable programming to be transmitted from four regional uplink centers to the Ciel 2 satellite.

“Ciel”). Ciel has received an approval-in-principle from Industry Canada to develop the new Ciel 2 satellite and will also be the Canadian licensee of Ciel 2.<sup>2</sup> Affiliates of DISH Network and Ciel have entered into an amended agreement to allow DISH Network to provide DBS service to the United States using the Ciel 2 satellite.<sup>3</sup>

The Bureau has already determined that authorizing service to the United States from EchoStar 5 at the nominal 129° W.L. orbital location is in the public interest.<sup>4</sup> The substitution of the state-of-the-art Ciel 2, with its spot-beam and CONUS capabilities, will allow significant improvements to that service. Among other things, this expanded capacity will help DISH Network meet the Commission’s February 17, 2010 digital carriage deadline. By that date, satellite carriers have to carry all local stations in high-definition (“HD”) format in at least 15% of the markets in which they carry any broadcast station in HD.<sup>5</sup> Moreover, as explained below, grant of the requested modification will not disrupt or degrade any currently operating DBS service, and comports with the Commission’s *DISCO II* policies. Just as important, the deployment of Ciel 2 will free up EchoStar 5 for redeployment to 148° W.L., where it will be used to remedy the loss of EchoStar 2 and restore full DBS service. DISH Network, therefore,

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<sup>2</sup> See Approval-in-Principle, *attached as Attachment B*.

<sup>3</sup> See Amendment #1, dated March 9, 2006, and Ciel 2 Satellite Services Agreement, dated August 19, 2005, *together attached as Attachment C* (redacted). Unredacted versions of the Amendment #1 and Ciel 2 Satellite Services Agreement are being submitted separately subject to a request for confidential treatment.

<sup>4</sup> See *EchoStar Satellite LLC*, 20 FCC Rcd 11755, at ¶¶ 6-11 (2005) (“*EchoStar 5 Order*”).

<sup>5</sup> See 47 C.F.R. § 76.66(k)(2)(i), *inserted by Carriage of Digital Television Broadcast Signals: Amendment of Part 76 of the Commission’s Rules*, Second Report and Order, 23 FCC Rcd 5351 (2008).

respectfully requests the expeditious grant of this application by January 4, 2009, since the satellite is expected to be ready to commence service on or about that date.

## **I. BACKGROUND**

In June 2005, the Bureau granted DISH Network authority to relocate the EchoStar 5 satellite to the nominal 129° W.L. orbital location, for operations as a Canadian satellite licensed to Ciel.<sup>6</sup> In addition, the Bureau granted DISH Network authority to operate 1,000,000 receive-only earth stations in the U.S. with EchoStar 5 at 129° W.L.<sup>7</sup>

Ciel will soon be launching Ciel 2, a new CONUS- and spot-beam DBS satellite, to the same nominal orbital location – 128.85° W.L. to be exact<sup>8</sup> – under a license issued by Industry Canada. The satellite will be owned and controlled by Ciel. Upon successful launch, Ciel 2 will replace EchoStar 5 at that orbital location. The satellite will use 16 DBS channels (channels 17-32) on one of two wide beams that cover the U.S. and Canada respectively. The remaining 16 DBS channels will be re-used multiple times across 53 spot beams focused on numerous areas in North America (including Alaska and Hawaii). The spectrum will be used to serve the United States. Service to Canada will consist of the Canadian government's rights to the use of one transponder on the satellite, and any channels that may be leased to Canadian DBS providers in the future.

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<sup>6</sup> See *EchoStar 5 Order* at ¶ 1.

<sup>7</sup> See *id.*

<sup>8</sup> Consistent with the *EchoStar 5 Order*, DISH Network is requesting that its authorized orbital location for Ciel 2 include any specific orbital location within the cluster defined by the Canadian 129° W.L. DBS assignment under the ITU Region 2 BSS Plan (including 128.85° W.L.). *Id.* at ¶ 1 n.1.

## II. GRANT OF THIS APPLICATION IS IN THE PUBLIC INTEREST

The Bureau has already determined that DISH Network's provision of DBS service to the United States from the Canadian-licensed EchoStar 5 satellite at the nominal 129° W.L. orbital location is in the public interest.<sup>9</sup> Replacement of the CONUS-only EchoStar 5 satellite with the new CONUS- and spot-beam capable Ciel 2 satellite will enable DISH Network to substantially expand service to the United States from that location. Grant of this application, therefore, will increase the public interest benefits associated with use of 129° W.L. to serve U.S. customers.

Specifically, authorizing service from the new Ciel 2 will expand the DBS capacity over the United States because the new spacecraft will more efficiently re-use DBS frequencies through a combination of spot beams and a CONUS beam. In that respect Ciel 2 is a product of the tremendous technical advancements that have enabled DBS operators to squeeze much more power into a satellite's payload since the mid-1990s, when EchoStar 5 was built. EchoStar 5 is a 16/32 transponder switchable satellite that can operate only on 16 transponders when in boost mode. In contrast, Ciel 2 can operate on all 32 transponders at power levels higher than EchoStar 5's boost mode. This will result in better reception and higher quality service to DISH Network subscribers from the nominal 129° W.L. orbital location. Consistent with DISH Network's plans to expand service to the United States from that location, DISH Network is also requesting an increase in the number of receive-only DBS earth stations authorized to receive signals from the satellite from 1,000,000 to 5,000,000.

Such expanded and improved service will be an important building block for DISH Network's plans to meet the Commission's February 17, 2010 digital carriage deadline for satellite carriers. Specifically, the Commission has required satellite carriers to carry all local

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<sup>9</sup> See *EchoStar 5 Order* at ¶ 6.

stations in HD format in at least 15% of the markets in which they carry any station in HD by that date. In addition, the increased capacity will enable DISH Network to compete more effectively in the multichannel video programming distributor (“MVPD”) market. The deployment of Ciel 2 to the nominal 129° W.L. orbital location will also free up the EchoStar 5 satellite for redeployment to the 148° W.L. slot. As the Commission is aware, DISH Network is licensed to operate on all 32 DBS channels at that location but has been unable to operate on 16 of those channels due to the recent failure of the EchoStar 2 satellite. DISH Network intends to seek Commission authority to redeploy EchoStar 5 to 148° W.L. to restore full 32-channel DBS service from that location.

No exchange of letters is necessary in this case to record the mutual understandings of the United States and Canada with respect to Ciel 2. In contrast with EchoStar 5, the present application does not involve a transfer of licensing responsibility from the United States to Canada, as Ciel 2 will be licensed by Industry Canada from the outset. There is therefore no need to reach mutual understandings with Canada on licensing responsibility for that satellite.

### **III. GRANT OF THIS APPLICATION WILL NOT DISRUPT OR DEGRADE ANY OTHER CURRENTLY OPERATING DBS SERVICE**

The grant of this application will not present any significant risk of harmful interference to other U.S. and non-U.S. DBS satellites. Currently, there are no operational satellites using the 12.2-12.7 GHz DBS frequencies within 9 degrees of the 129° W.L. location and, as demonstrated in the attached Technical Annex, the operation of Ciel 2 from the nominal 129° W.L. orbital location will pose no risk of harmful interference to any existing DBS operator. The closest operational DBS satellites are EchoStar 7 and DIRECTV 7S at the nominal 119° W.L. orbital location, or about 10 degrees away. As a result, the proposed operations “will not

disrupt or degrade any currently operating DBS service.”<sup>10</sup> The Administration of Canada is responsible for consulting with all administrations that may be deemed “affected” by Ciel 2, as that term is defined in the ITU Radio Regulations, and Ciel 2 will be operated in conformance with all coordination agreements reached through this process.

#### **IV. GRANT OF THIS APPLICATION IS CONSISTENT WITH THE COMMISSION’S *DISCO II* POLICIES**

Under the Commission’s *DISCO II* framework, the Commission considers a number of public interest factors in evaluating requests to provide DBS service to the United States from a foreign-licensed DBS satellite, including the effect on competition in the United States, compliance with eligibility and technical requirements, spectrum availability, and effects on national security, law enforcement, foreign policy and trade concerns.<sup>11</sup> As part of this analysis, the Commission examines the “effective competitive opportunities” afforded to U.S. satellite operators in the home market of the foreign satellite seeking U.S. market access (the “ECO-Sat” test).<sup>12</sup>

In the *EchoStar 5 Order*, the Bureau held that allowing DISH Network to use EchoStar 5 to provide DBS service into the U.S. from the Canadian orbital location at 129° W.L. was

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<sup>10</sup> See *EchoStar 5 Order* at ¶ 11.

<sup>11</sup> See *Amendment of the Commission’s Policies to Allow Non-U.S. Licensed Space Stations Providing Domestic and International Service in the United States*, 12 FCC Rcd 24094, 24170-72 (1997) (“*DISCO II*”).

<sup>12</sup> *Id.* at 24098 (“For satellites licensed by non-WTO Members and for all satellites providing Direct-to-Home (DTH), Direct Broadcasting Satellite (DBS), and Digital Audio Radio Services (DARS), we will examine whether U.S. satellites have effective competitive opportunities in the relevant foreign markets to determine whether allowing the foreign-licensed satellite to serve the United States would satisfy the competition component of the public interest analysis.”).

consistent with the Commission's *DISCO II* policies and the ECO-Sat test.<sup>13</sup> In particular, the Bureau found that there was "no evidence that this access [to the 129° W.L. orbital location to provide DBS service into the U.S.] will create a competitive distortion by allowing [DISH Network] to carry out a predatory strategy."<sup>14</sup> Further, the Bureau held that "[i]nasmuch as there is no competitive distortion associated with this authorization and grant of this authorization will facilitate the increase in provision of local broadcast channel service, we find that the benefits associated with grant of [DISH Network's] proposal are compelling and warrant approval of this request."<sup>15</sup> Indeed, on numerous occasions since 2003, the Bureau has concluded that the provision of DBS service to the United States using Canadian-licensed satellites would serve the public interest.<sup>16</sup>

The Bureau's *EchoStar 5 Order* controls this case. For exactly the same reasons discussed therein, DISH Network's proposal to provide expanded and improved service to the United States from the Ciel 2 satellite is consistent with the Commission's *DISCO II* policies. As in the case of EchoStar 5, there is no evidence that the use of Ciel 2 to provide DBS service to the United States will cause any competitive distortions in the U.S. market. Ciel 2 will also be used to "facilitate the increase in provision of local broadcast channel service" in HD format to meet the Commission's 2010 deadline for satellite carriers to initiate HD carry-one-carry-all

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<sup>13</sup> *EchoStar 5 Order* at ¶¶ 8-10.

<sup>14</sup> *Id.* at ¶ 9.

<sup>15</sup> *Id.* at ¶ 10.

<sup>16</sup> See *Digital Broadband Applications Corp.*, Order, 18 FCC Rcd 9455 (2003); *Pegasus Development Corp.*, Order, 19 FCC Rcd 6080, 6086 (2004). See also *DIRECTV Enterprises LLC*, File No. SES-MFS-20061213-02157 (granted Mar. 9, 2007) and *EchoStar Satellite LLC*, Order and Authorization, 20 FCC Rcd 11755 (2005).

service in at least 15% of the relevant markets. The public interest reasons for authorizing DBS service from the new Ciel 2 in this case are, indeed, even more compelling than those cited in the *EchoStar 5 Order* and the other Bureau decisions authorizing DBS service to the United States from other Canadian-licensed satellites.

DISH Network and the proposed Ciel 2 operations also meet all of the other requirements under *DISCO II* for grant of an authorization to provide service from a foreign-licensed DBS satellite. DISH Network's qualifications to hold Commission authorizations are a matter of record. This application does not raise any national security, law enforcement, foreign policy or trade concerns. In addition, a full technical description of the Ciel 2 satellite that complies with all of the requirements of Section 25.114 (except as discussed below) is included in the Schedule S and Attachment D to this application.

## **V. WAIVER REQUEST**

Section 25.114(d)(3) of the Commission's rules requires submission of predicted antenna gain contours for each transmit and receive antenna beam in a .gxt format "at 2 dB intervals down to 10 dB below the peak value of the parameter and at 5 dB intervals between 10 dB and 20 dB below the peak values." A limited waiver of this rule section is requested in connection with Ciel 2.

The .gxt files submitted here with Schedule S supply all the contours identified in the rule for the spacecraft's CONUS and Canadian beams, and all but two of the specified contours for the spot beams. The only exception is that the -8 dB and -15 dB contours are not supplied for the spot beams.

The absence of these two contours is not material. In fact, the various contours for the spot beams are so close together that it is virtually impossible to distinguish among the contours as it is. Furthermore, the -2, -4, -6, -10 and -20 dB contours provided, along with the antenna



boresight data supplied in the technical materials, constitute sufficient information for an interested party to understand the planned operation of Ciel 2 and evaluate its impact on an adjacent network.

In these circumstances, grant of a waiver is consistent with Commission policy:

The Commission may waive a rule for good cause shown. Waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the general rule. Generally, the Commission may grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.<sup>17</sup>

The Commission has previously waived the requirements of Section 25.114(d)(3) in other cases in which contour information was not being submitted exactly as specified in the rule.<sup>18</sup> In acting on these requests, the Commission recognized that the purpose of the rule is to ensure that adequate information is available to allow evaluation of the potential for harmful interference.<sup>19</sup> Here sufficient data is provided to permit the Commission and any interested party to evaluate the antenna's interference potential, and a limited waiver of Section 25.114(d)(3) is accordingly appropriate.

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<sup>17</sup> *PanAmSat Licensee Corp.*, 17 FCC Rcd 10483, 10492 (Sat. Div. 2002) (footnotes omitted).

<sup>18</sup> *See, e.g.*, Application of PanAmSat Licensee Corp., File No. SAT-RPL-20061219-00155, Call Sign S2715, grant stamp dated April 24, 2007 (“*Galaxy 17 Grant*”) at ¶ 5; *see also Spectrum Five, LLC, Petition for Declaratory Ruling to Serve the U.S. Market Using Broadcast Satellite Service (BSS) Spectrum from the 114.5° W.L. Orbital Location*, Order and Authorization, DA 06-2439, File Nos. SAT-LOI-20050312-00062/00063 at ¶ 17 (IB rel. Nov. 29, 2006).

<sup>19</sup> *Galaxy 17 Grant* at n.5.

## VI. ORBITAL DEBRIS MITIGATION

Section 25.283(c) of the Commission's orbital debris rules requires space station licensees to ensure that, at the spacecraft's end-of-life, "all stored energy sources on board the satellite are discharged, by venting excess propellant, discharging batteries, relieving pressure vessels, and other appropriate measures."<sup>20</sup> The satellite will comply this directive with one qualification: certain helium tanks on the Ciel 2 spacecraft will not be fully vented at end-of-life, but instead will be permanently sealed and isolated following transfer orbit operations.<sup>21</sup>

The scope of Section 25.283(c) is somewhat uncertain.<sup>22</sup> A number of applicants have presented to the Commission satellites that do not fully vent all pressure vessels at end-of-life, but which instead securely store oxidizer or inert gases on board the spacecraft.<sup>23</sup> In *Hughes*, the

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<sup>20</sup> 47 C.F.R. § 25.283(c).

<sup>21</sup> See Attachment D, p.A.9.2.

<sup>22</sup> As a threshold matter, it is unclear whether section 25.283(c) applies to the Canadian-licensed Ciel 2 satellite. The Commission has said that applicants requesting authority to communicate with a foreign-licensed satellite may satisfy the Commission's disclosure rules "by showing that the satellite system's debris mitigation plans are subject to direct and effective regulatory oversight by the satellite system's national licensing authority." *Mitigation of Orbital Debris*, 19 FCC Rcd 11567, at ¶ 95 (2004). This suggests that, where a foreign-licensed satellite is subject to foreign debris mitigation rules, a further showing of compliance with U.S. debris mitigation rules is not required. In this case, Industry Canada has a policy of requiring its geostationary space station licensees to comply with the debris mitigation measures in Recommendation ITU-R S.1003 "Environmental Protection of the Geostationary Satellite Orbit." See Industry Canada, CPC-2-6-02, *Licensing of Space Stations*, at § 4.3(vi) (July 2008), at <http://www.ic.gc.ca/epic/site/smt-gst.nsf/en/sf01385e.html> (last visited Sep. 25, 2008).

<sup>23</sup> See *Hughes Communications, Inc.*, Stamp Grant, File Nos. SAT-MOD-20050523-00106, SAT AMD-20060306-00025 (granted Jun. 24, 2006) ("*Hughes*") (authorized without waiver); *PanAmSat H-2 Licensee Corp.*, Stamp Grant, File No. SAT-AMD-20070731-00108 (granted Nov. 30, 2007) ("*PanAmSat H-2*") (authorized with waiver); *PanAmSat Licensee Corp.*, Stamp grant, File No. SAT-AMD-20070716-00102 (granted Oct. 4, 2007) ("*Intelsat 11*") (authorized with waiver); *EchoStar Corporation*, File No. SAT-STA-20071221-00183, at ¶ 4 (granted Mar. 12, 2008) ("*AMC-14*") (authorized with waiver).

satellite provider explained that post-mission storage of inert gases, such as xenon and helium, “is fully in keeping with the intent” of the Commission’s rules because “it will neither pose a risk of deflagration nor lead to the ejection of material.”<sup>24</sup> The storage of residual helium in this case is indistinguishable from *Hughes*. The rule would therefore appear not to be implicated in this case, especially since Ciel 2 is a foreign-licensed satellite subject to Canada’s orbital debris mitigation requirements.

In any event, DISH Network respectfully requests a waiver of section 25.283(c) to the extent one is needed. The Bureau may waive compliance with Commission rules for “good cause shown.”<sup>25</sup> Here, there is good cause for a waiver of Section 25.283(c). The purpose of the rule would not be undermined at all. The post-mission storage of inert helium gas in secure tanks shielded by the rest of the spacecraft, and under pressures well below the tolerances of the storage tanks, would present a “a far lower risk of accidental explosion over time than would any attempt to completely depressurize the tanks during or after the spacecraft’s mission.”<sup>26</sup> Equally important, in similar cases, the Commission has waived this rule on the ground that requiring a modification to the satellite at a late stage of construction would cause undue hardship to the

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<sup>24</sup> See *Hughes* (authorizing post-mission storage of helium and xenon without waiver). In *Hughes*, the applicant explained that secure storage of such gases “is both a responsible approach and results in a far lower risk of accidental explosion over time than would any attempt to completely depressurize the tanks during or after the spacecraft’s mission,” and “is fully in keeping with the intent” of the Commission’s rules. See Amendment at Attachment A, p.22, File No. SAT AMD-20060306-00025 (filed Mar. 6, 2006) (“*Hughes Amendment*”). See also *AMC-14* at ¶ 4 (finding that post-mission storage of “oxidizer” is not “the equivalent of” post-mission storage of “an inert gas such as xenon ... for purposes of assessing whether the intent of the rule would be satisfied.”).

<sup>25</sup> See 47 C.F.R. § 1.3.

<sup>26</sup> See *Hughes Amendment* at Attachment A, p.22.

applicant.<sup>27</sup> That justification also applies here. The construction of Ciel 2 is almost complete, and the satellite is in fact scheduled to be launched in early December and is expected to be ready to commence service on or about January 4, 2009. As noted above, the Bureau has licensed spacecraft and/or waived Section 25.283(c) on a number of occasions on similar grounds, and DISH respectfully requests that the Bureau follow its precedent here.

## VII. CONCLUSION

For the foregoing reasons, DISH Network respectfully requests that the Bureau expeditiously grant this modification application by January 4, 2009.

Respectfully submitted,

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/s/

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September 26, 2008

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<sup>27</sup> See *PanAmSat H-2*; *Intelsat 11*; *AMC-14*.

**ATTACHMENT A**  
Fee Waiver Request

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

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In the Matter of )

**ECHOSTAR SATELLITE OPERATING L.L.C.** )

Petition for Waiver of )  
Application Fees Pursuant to )  
Section 1.1117 of the Commission's Rules )

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**To: Office of the Managing Director**

**PETITION FOR WAIVER OF APPLICATION FEES**

EchoStar Satellite Operating L.L.C. ("DISH Network") respectfully requests that, pursuant to Sections 1.3 and 1.1117 of the Commission's Rules,<sup>1</sup> and the Communications Act of 1934, as amended (the "Act"),<sup>2</sup> the Commission waive to the extent necessary certain application fees associated with its concurrently filed application to modify its blanket receive-only earth station authority to add the Canadian-licensed Ciel 2 satellite as a point of communication at 129° W.L., and to increase the number of authorized earth stations from 1,000,000 to 5,000,000.<sup>3</sup> The Commission's Rules and the Act specifically provide that such fees may be waived where good cause is shown and the public interest would be served.<sup>4</sup> As demonstrated below, good cause exists for, and the public interest would be served by, waiver of

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<sup>1</sup> 47 C.F.R. §§ 1.3 and 1.1117.

<sup>2</sup> 47 U.S.C. § 158(d)(2).

<sup>3</sup> See File No. SES-MFS-2008\_\_\_\_\_ (filed Sep. 22, 2008) ("Application"). For convenience, this petition is being attached as an Attachment to this application.

<sup>4</sup> 47 C.F.R. § 1.1117; 47 U.S.C. § 158(d)(2).

fees in this case because the modification application fee would not be commensurate with the Commission's actual costs of processing DISH Network's Application and would represent a regulatory barrier to DISH Network's proposed provision of service. If the Commission determines that a fee is required, DISH Network requests that the Commission find that the "VSAT" modification application fee is appropriate. DISH Network has already paid the \$170 fee for such applications, to which the instant request to provide service to up to a 5,000,000 receive-only dishes is similar.

## **I. BACKGROUND**

DISH Network is requesting a modification to its blanket earth station authorization to add the Canadian-licensed Ciel 2 satellite as a point of communication, and to increase the number authorized earth stations from 1,000,000 to 5,000,000, so that it can expand its provision of multichannel video services to consumers in the United States. The Commission's Rules do not designate any specific charges for the type of application being filed in the DBS service. The following schedule of charges for applications for the types of services which could be applied to DISH Network's Application include:

- Modification of License Application for a Fixed Satellite Very Small Aperture Terminal (VSAT) System = \$170 per system<sup>5</sup>
- Modification of License for a Receive-Only Earth Stations = \$170 per station<sup>6</sup>

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<sup>5</sup> See *International and Satellite Services Fee Filing Guide* at 13 (effective Feb. 14, 2008) ("*Fee Filing Guide*").

<sup>6</sup> *Fee Filing Guide* at 12.

DISH Network's proposed network of DBS earth stations is most like a VSAT system; therefore, it should be subject to at most the \$170 application fee for an application to modify a VSAT system.

DISH Network's proposed system architecture will consist of as many as 5,000,000 technically identical earth stations operating in the DBS portion of the Ku-band. This architecture is consistent with the FCC's definition of VSAT networks which are networks of technically identical small antennas that generally communicate with a larger hub station and operate in the 12/14 GHz frequency bands.<sup>7</sup> Because DISH Network believes that its system is most like a VSAT network, it has paid the \$170.00 VSAT system modification fee. However, if the Commission determines that the \$170.00 per station fee for receive-only earth stations applies to this application, DISH Network seeks a waiver of that \$850 million application fee.

## **II. GOOD CAUSE EXISTS FOR, AND THE PUBLIC INTEREST WOULD BE SERVED BY, WAIVER OF THE RECEIVE-ONLY EARTH STATION APPLICATION FEE**

The Commission has the authority to waive application fees where -- such as here -- good cause is shown and the public interest would be served.<sup>8</sup> As demonstrated below, a fee of up to \$850 million would be prohibitively high for DISH Network, would deny competitive service offerings to the public, and would not be commensurate with FCC processing resources.

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<sup>7</sup> See *Streamlining the Commission's Rules and Regulations for Satellite Application and Licensing Procedures*, Order, 11 FCC Rcd. 21581, 21592 (1996).

<sup>8</sup> See *WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969), *aff'd*, 459 F.2d 1203 (D.C. Cir. 1972), *cert. denied*, 409 U.S. 1027 (1972).



**A. FCC Application Fees are Intended to Recover the Costs of Standard Application Processing**

The Commission's schedule of application fees is intended to reimburse the government for the work involved in providing certain regulatory services associated with processing applications. In setting the fees, the Commission has noted that "the charges represent a rough approximation of the Commission's actual cost of providing the regulatory actions listed" and that "the very core of this effort is to reimburse the government -- and the general public -- for the regulatory services provided to certain members of the public."<sup>9</sup> However, in certain instances, the Commission's schedule of filing fees may not reasonably approximate the costs involved in handling a particular application or may not otherwise serve the public interest. For this reason, the Commission's Rules and the Act allow for parties to seek a waiver of the application fees.<sup>10</sup>

A filing fee waiver is warranted here because many of the processing activities required to issue a new system license -- the costs of which the application fees are designed to recover -- are simply not required in reviewing DISH Network's Application. For example, the Commission need not review 5,000,000 different technical parameters to grant DISH Network's Application. Rather, as in the case of a VSAT network, the Commission only needs to review one set of technical parameters for all of the technically identical earth stations. In similar contexts, the Commission has accepted application fees for VSAT networks.<sup>11</sup> Thus, the

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<sup>9</sup> *Establishment of a Fee Collection Program to Implement the Provisions of the Consolidated Omnibus Budget Reconciliation Act of 1985*, Report and Order, 2 FCC Rcd. 947, 948 (1987).

<sup>10</sup> See *supra* note 4.

<sup>11</sup> See, e.g., *Application of EchoStar Satellite Operating Corporation for Pro Forma Assignment of Blanket Earth Station License*, File No. SES-ASG-20070228-00278, (granted Apr. 3, 2007) (fee waiver granted in a letter from Mark Stephens, CFO, FCC, to Pantelis

\$170.00 application fee paid for this Application would be consistent with past practice and fairly compensate the Commission for the costs involved in its review of the application.

**B. The Public Interest Would Be Served by Granting the Requested Fee Waiver**

In addition to being supported by the requisite good cause, granting DISH Network's request for a waiver of application fees for its Application is also consistent with the public interest. As described in detail in the Application, grant of the authority requested by DISH Network to provide DBS services in the United States using the Ciel 2 satellite at 129° W.L. will further a number of compelling public interest objectives. Among other benefits, a grant would: (i) expand and improve the DBS service that DISH Network can provide to the United States; (ii) facilitate DISH Network's compliance with the Commission's February 17, 2010 deadline for satellite carriers to carry all local stations in high-definition ("HD") format in at least 15% of the markets in which they carry any station in HD; and (iii) enable DISH Network to compete more effectively against in the MVPD market.

DISH Network should not be required to pay a \$170.00 fee for each of its 5,000,000 earth stations merely because it is providing service from a non-U.S. satellite when an operator providing an identical service using a U.S.-licensed satellite would not need to apply for licenses for each of its consumer dishes.<sup>12</sup> The result would be overtly discriminatory treatment among

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Michalopoulos, Counsel for EchoStar Satellite L.L.C., dated May 9, 2007); *Application of DIRECTV Enterprises, LLC*, DA 04-2526 (rel. Aug. 13, 2004) (approving application in which applicant paid VSAT application fee for 1,000,000 receive-only terminals to be used for DBS service from a Canadian satellite).

<sup>12</sup> Except for the fact that DISH Network will be using a Canadian orbital location, EchoStar would not have to file an application for these earth stations. *See* 47 C.F.R. § 25.131(j); *see also In the Matter of Telesat Canada Petition for Declaratory Ruling for Inclusion of ANIK F1 on the Permitted Space Station List*, Order, 16 FCC Rcd 16365, 16369 (2001) (holding that "receive-only earth stations receiving transmissions from any non-U.S. licensed satellite, regardless of whether the satellites is on the Permitted List, must be licensed.").

domestic- and foreign-licensed DBS and Direct-to-Home (“DTH”) providers serving the United States. Such a result would also not be consistent with the Commission’s recent decision to eliminate the requirement to obtain a license – or to pay a separate fee – for U.S. receive-only earth stations to communicate with foreign-licensed Fixed Satellite Service satellites on the Permitted Space Station List.<sup>13</sup>

### **III. CONCLUSION**

Under current Commission fee guidelines, DISH Network could potentially be required to pay a fee of \$170.00 for each of its 5,000,000 receive-only earth stations. That would amount to a total fee of up to \$850 million. Clearly, the imposition of such a high fee was not what Congress or the Commission intended when the fee guidelines were adopted. Such an astronomical application fee would be a barrier to any operator that desires to offer an innovative, competitive service to the public, as proposed by DISH Network.

The financial hardship that a \$850 million filing fee would impose on DISH Network, or indeed any other entity, would clearly preclude an application from being filed at all. Filing fees should reimburse the government for the costs of processing applications, not act as a regulatory barrier to entry for competitive services. For all of the aforementioned reasons, DISH Network respectfully requests that the Commission grant the requested fee waiver to the extent necessary in conjunction with its Application to provide DBS service from Ciel 2 at 129° W.L.

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<sup>13</sup> See *Amendment of the Commission’s Space Station Licensing Rules and Policies*, Second Report and Order in IB Docket No. 02-34, Second Report and Order in IB Docket No. 00-248, and Declaratory Order in IB Docket No. 96-111, 18 FCC Rcd 12507, 12516-17 (2003).

Respectfully submitted,

/s/

Pantelis Michalopoulos

Petra A. Vorwig

**Steptoe & Johnson LLP**

1330 Connecticut Avenue, N.W.

Washington, D.C. 20036-1795

(202) 429-3000

*Counsel for EchoStar Satellite Operating L.L.C.*

Dated: September 22, 2008

cc: Anthony Dale, Managing Director, Office of the Managing Director (via hand delivery)

**ATTACHMENT B**  
Approval-in-Principle



Our File: 6215-22

FEB - 1 2005  
EV.

Mr. Kevin B. Smyth  
Chief Executive Officer  
Ciel Satellite Communications Inc.  
5570 Pettapiece Crescent  
Manotick, Ontario K4M 1C5

Dear Mr. Smyth:

This is further to our letter of 1 October, 2004 in which Ciel Satellite Communications Inc. was required to demonstrate compliance with Canadian ownership and control requirements prior to the issuance of an approval in principle for the development and operation of a broadcasting-satellite space station at the 129°W orbital position.

The Department has reviewed and assessed the documentation relating to ownership and control that Ciel Satellite Communications Inc. has submitted. We note that the final corporate structure of the licensee will be that of a limited partnership, the Ciel Satellite Limited Partnership, the general partner of which is Ciel Satellite Communications Inc. Our review indicates that the partners of Ciel Satellite Limited Partnership are individually eligible to hold licences as radiocommunication carriers based on the information provided thus far, and subsequent discussions with and commitments by Ciel Satellite Limited Partnership and its partners.

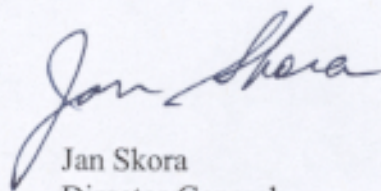
Therefore, I am pleased to provide Ciel Satellite Limited Partnership with our approval in principle to develop and operate a broadcast-satellite space station at the 129°W orbital position using the 12 GHz frequency band. This approval is subject to Ciel Satellite Limited Partnership providing the Department with the final ownership and control information for approval by the Department, and subject to the attached conditions of licence.

.../2



I look forward to the implementation of your service offerings in the coming years and the contributions your satellite will make toward connecting Canadians. In keeping with our commitment to open, fair and transparent licensing processes, this letter will be posted on the Department's Strategis website.

Yours sincerely,

A handwritten signature in dark ink, appearing to read "Jan Skora". The signature is fluid and cursive, with the first name "Jan" being more prominent than the last name "Skora".

Jan Skora  
Director General  
Radiocommunications and  
Broadcasting Regulatory Branch

Attachment



## **Attachment**

### **Conditions of Licence for Ciel Satellite Limited Partnership (Ciel LP) BSS Satellite Operating at 129°W Orbital Position**

#### **Eligibility**

1. Ciel LP shall conform on an on-going basis with the Canadian ownership and control requirements as set out for a radiocommunication carrier in section 10(2)(d) of the *Radiocommunication Regulations*.

#### **Licence Transfer**

2. This licence may not be transferred or assigned without full review of the application by the Department and the authorization of the Minister. For clarification and without limiting the generality of the foregoing, "transfer" includes any leasing, sub-leasing or other disposition of the rights and obligations of the licence, and also includes any change which would have a material effect on the ownership or control in fact of Ciel LP.

#### **Serving Canadian Broadcasting Needs**

3.
  - a) Ciel LP shall operate its interim and new satellite facilities as a Canadian telecommunications common carrier.
  - b) Notwithstanding condition 3(a), Ciel LP may assign up to 50 percent of the capacity of the new satellite to serve foreign broadcasting needs for the term of the licence.
  - c) Ciel LP shall retain a minimum of 50 percent of the capacity of the new satellite for Canadian broadcasting needs until the launch of the new satellite, and shall initiate a public "call for interest" to determine Canadian needs for this retained satellite capacity. This "call for interest" shall not close before the launch of the new satellite. In addition to the capacity identified in condition 3(b), should the retained capacity exceed contracted Canadian requirements, Ciel LP may also assign such excess retained capacity for service in other countries for the term of the licence.
  - d) Should Ciel LP apply to the Department to license a replacement for the new satellite, the Department may review the applicability of conditions 3(b) and 3(c).
4. The new satellite to be operated under this licence shall be capable of serving all regions of Canada visible from the assigned orbital position, including Northern Canada.



## Milestones

5. Ciel LP shall meet all implementation milestones by the respective dates set out in the following table:

	Milestone	Date
1	Placement of an interim satellite into the authorized orbital position	25 August 2005
2	Submission to Department for approval of final design specifications for a new satellite to be operated at the authorized orbital position.	31 December 2005
3	Final signature of contracts for (1) the construction of the new satellite, and (2) the launch of the new satellite into the authorized orbital position by milestone 4	31 July 2006
4	Placement of the new satellite into the authorized orbital position.	31 December 2008

## Capacity to Improve Connectivity

6. Ciel LP shall fulfill its commitment to provide one transponder (or equivalent) for the life of the new satellite, or other satellite capacity acceptable to the Department, free of charge for special initiatives, such as the National Satellite Initiative being delivered by Industry Canada, aimed at improving connectivity in under-served areas of Canada. Such special initiatives will be developed in consultation with the Department.

## International Coordination

7. Ciel LP shall, at its own expense, participate with the Department to effect the successful modification of the BSS frequency assignment plans of Appendix 30/30A of the ITU *Radio Regulations*, provide the Department, in a form acceptable to the ITU, with any required information, and be responsible for the payment of all ITU processing charges related to the submission of this information.
8. Ciel LP shall operate its satellites in accordance with the successful modification to the Appendix 30/30A plan and shall fulfill all commitments made by Canada pursuant to all international coordination and any other arrangements for the operation of a direct broadcast satellite facility in the 129° W orbital position.



### **Industrial Benefits**

9. Ciel LP shall make fair and reasonable efforts to develop, promote and purchase satellite network components from Canadian manufacturers.

### **Operational Requirements**

10. Ciel LP shall ensure the satellites operated under this licence are under its direction or control consistent with section 3(3)(b) of the *Radiocommunication Act*.
11. Ciel LP shall operate the satellites within the provisions of the ITU *Radio Regulations*, Canadian legislative and regulatory requirements, and Departmental spectrum policies.

### **Reporting**

12. Semi-annually until the launch of the new satellite into the authorized orbital position, and annually thereafter, Ciel LP shall submit a detailed report to Industry Canada. This report shall include:
  - An update indicating progress made in all areas respecting this licence;
  - An update indicating continued compliance with all licence conditions;
  - An update on any negotiations undertaken pursuant to condition 7;
  - An update on activities related to improving connectivity in underserved areas of Canada;
  - Copies of any existing report for Ciel LP's fiscal year with respect to this authorization;
  - A current listing of all satellite capacity being made available through this authorization, the capacity assigned to Canadian service providers and others, including the parties to which it is assigned, and any unused capacity including the terms of its availability; and
  - An update on all aspects of design, procurement, construction, coordination and launch of the satellite facilities, as well as the "call for interest" to determine Canadian needs, until the new satellite has been put into service.

### **Licences and Licence Fees**

13. Ciel LP shall obtain the necessary radio licences for the satellites prior to commencing operation, and Ciel LP shall pay applicable annual authorization fees in advance on or before March 31 of each year.

**ATTACHMENT C**  
Ciel 2 Agreement (Redacted)

## SATELLITE SERVICE AGREEMENT FOR CIEL-2

**THIS AGREEMENT** between Ciel Satellite Communications Inc. (“Ciel”), on the one hand, and EchoStar Satellite L.L.C. (“Customer”) \*\*\* on the other hand, is made effective as of 19 August 2005 (the “Effective Date”). Defined terms used in this Agreement have the meanings specified herein. \*\*\*

### ARTICLE 1. SERVICE PROVIDED

**1.A. Scope.** Ciel is the licensee of the BSS frequencies at the 129° W.L. orbital location (the “Orbital Location”) and intends to construct, launch and operate a BSS communications satellite designated as the “Ciel 2 Satellite” in one Orbital Location. Ciel intends to begin providing commercial service on the Ciel-2 Satellite to the \*\*\* In accordance with and subject to the terms and conditions of this Agreement, Ciel has agreed to provide certain satellite services to Customer and reserve certain of the capacity of the Ciel-2 Satellite in observance of Ciel’s obligations set forth in the Conditions of Licence. \*\*\* The Service shall be provided in accordance with and subject to the terms and conditions set forth in this agreement, including Attachments A — H (as listed below), which are hereby incorporated by reference in their entirety (collectively, the “Agreement”). In the event of any conflict or inconsistency between the terms and conditions set forth in the body of this Agreement and the terms and conditions set forth in any Attachment hereto, then the terms and conditions set forth in the body of this Agreement shall control.

Attachment A — Technical Performance Specifications

\*\*\*

#### **1.B. Terms Related to Construction Contract, Launch Service Agreement, and Insurance.**

**1.B(3)** Ciel and Customer shall collaborate in good faith toward reaching agreements on the Technical Performance Specifications and other requirements for, and toward the successful construction, insurance and launch of, the Ciel-2 Satellite, provided that in the event that Ciel and Customer are not able to otherwise agree on any of the above-listed items, then \*\*\*

Subject to the parties’ respective rights and obligations set forth in the immediately preceding paragraph, the parties shall use commercially reasonable efforts to cause the execution of the Construction Contract and complete the Technical Performance Specifications \*\*\* Upon completion, the Technical Performance Specifications shall be attached hereto as Attachment A, and shall be deemed to be incorporated by reference in their entirety. \*\*\*

\*\*\* the relevant parameters established pursuant to the Construction Contract shall be extracted and used as the basis for the values to be utilized in the Technical Performance Specifications to this Agreement. \*\*\*

**1.B(4)** \*\*\* Notwithstanding the foregoing, Ciel agrees to notify Customer of all changes to the

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Satellite (even if the relevant changes do not affect the Technical Performance Specifications), within a reasonable period of time after making such changes.\*\*\*

**1.B(7)** Ciel agrees to keep Customer promptly apprised of all material third party discussions related to the Launch Service Agreement. Ciel, \*\*\* shall collaborate with and include Customer in all significant decisions related to the Launch Service Agreement, \*\*\* Subject to any applicable ITAR and EAR restrictions, Customer and Customer's U.S. citizen representatives shall be permitted to participate in reviews of each of the launch service provider's milestone events with respect to launch of the Satellite. Customer and Customer's guests may \*\*\* attend the launch of the Satellite.

**1.B(8)** Ciel agrees to keep Customer promptly apprised of all material third party discussions related to insurance. Ciel, \*\*\* shall collaborate with and include Customer in all significant decisions related to insurance, including without limitation the placement of insurance, \*\*\*

**1.B(13)** \*\*\* In the event of any conflict or inconsistency between Ciel's obligations in this Subsection 1.B(13), any other provision of this Agreement and the Conditions of Licence, the Conditions of Licence shall prevail over Ciel's obligations in this Subsection 1.B(13) and any other provision of this Agreement, and Ciel's obligations in this Subsection 1.B(13) shall prevail over any other provision of this Agreement.

**1.C. Service Term.** The term for Service (the "Service Term") on any Satellite \*\*\* shall commence on the In-Service Date for that Satellite, and, except as otherwise provided herein, shall expire on the earlier of (1) ten (10) years after such In-Service Date (the "Initial Term"), or (2) the date that Satellite becomes a Failed Satellite. The Service Term on any Satellite \*\*\* that is not a Failed Satellite may be extended at Customer's sole option for successive one-year periods (or a portion thereof in the case of the final extension) until the Satellite reaches its End-of-Life (each an "Extended Term"), upon written notice to Ciel provided at least \*\*\* prior to the end of the Initial Term and/or the then current Extended Term, and provided that, at the time of each such extension, Customer is in full compliance with all of its obligations under this Agreement.

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**1.D. Notices.** All notices regarding technical or operational matters requiring immediate attention shall be given by telephone to the telephone number set forth below for Customer and the telephone number set forth in the User's Guide for Ciel and shall be followed by written notification in accordance with the procedure set forth below. Any other notice required or permitted to be given hereunder shall be in writing and shall be sent by facsimile transmission, or by first class certified mail, postage prepaid, or by overnight courier service, charges prepaid, to the party to be notified, addressed to such party at the address set forth below, or sent by facsimile to the fax number set forth below, or such other address or fax number as such party may have substituted by written notice to the other party. The sending of such notice with confirmation of receipt thereof (in the case of facsimile transmission) or receipt of such notice (in the case of delivery by mail or by overnight courier service) shall constitute the giving thereof.

**If to be given to Customer:**

Attn: David Bair  
Senior Vice President, Space Programs and Operations  
EchoStar Satellite L.L.C.

P.O. Box 6655 (for first class certified mail)  
Englewood, CO 80155

9601 S. Meridian Blvd. (for overnight courier)  
Englewood, CO 80112

Fax #: \*\*\*

cc: David K. Moskowitz, Esq.  
Executive Vice President & General Counsel  
(same addresses and fax number)

cc: R. Stanton Dodge, Esq.  
Senior Vice President & Deputy General Counsel  
Fax #: \*\*\*  
(same addresses)

**If to be given to Ciel:**

Attn: Kevin Smyth  
Chief Executive Officer  
Ciel Satellite Communications Inc.  
Suite 104  
240 Terence Matthews Crescent  
Kanata, ON  
Canada K2M 2C4

Fax #: \*\*\*

cc: Scott Gibson  
Vice President and General Counsel  
(same address and fax number)

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**Customer's 24-Hour Emergency Telephone # for Technical/Operational Issues:**

Tel #: \*\*\*

**ARTICLE 2. PAYMENTS AND OTHER CONSIDERATIONS/ \*\*\***

**2.B. Monthly Recurring Charges.**

**2.B(1)** Commencing on the In-Service Date and for the duration of the Service Term (including any Extended Terms) Customer shall pay to Ciel for the Service a monthly recurring service charge (the "MRC") with respect to the Ciel-2 Satellite \*\*\*

**2.C. Monthly Recurring Charges Adjustments/Refunds.**

**2.C(1)** In the event of a Partial Loss (but not a Satellite Failure), Customer shall be entitled to a refund of any MRC already paid, and a reduction of the MRC to be paid, in either case applicable to the period of such Partial Loss until either (a) such Partial Loss is restored through the use of spare equipment on the Satellite, or (b) the Service Term ends, in an amount calculated in accordance with the provisions in Attachment B hereto, \*\*\*. Ciel shall refund to Customer any Charges paid for periods subsequent to the date of a Satellite Failure, including the period between and including the date of the Satellite Failure and the date upon which it is determined that a Satellite Failure has occurred.

\*\*\*

**ARTICLE 3. REPRESENTATIONS, WARRANTIES AND COVENANTS**

**3.A. Ciel's Representations, Warranties and Covenants.** Ciel hereby represents, warrants and covenants to Customer as follows:

**3.A(1)** It is a federal corporation duly organized, validly existing and in good standing under the laws of Canada. It is duly licensed or qualified to do business as a foreign or extraprovincial corporation in all jurisdictions where the failure to be so qualified would materially adversely affect its ability to perform its obligations hereunder. It has all requisite power and authority to own its properties and carry on its business as now conducted.

**3.A(2)** The execution, delivery and performance (as provided herein) by Ciel of this Agreement has been duly authorized by all requisite corporate action of Ciel (including without limitation any necessary action of its directors and shareholders) and shall not violate any applicable provisions of law or any order of any court or any agency of government and shall not conflict with or result in a breach under (a) its constating documents, or (b) any material agreement to which Ciel is a party or by which it is bound. This Agreement is a legal, valid and binding obligation of Ciel, enforceable in accordance with its terms, except as limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting creditors' rights generally.

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**3.A(3)** Ciel has not retained or authorized anyone to represent it as a broker or finder in connection with this Agreement.

**3.A(4)** In connection with Ciel's performance under this Agreement, Ciel shall comply in all material respects with all applicable laws, regulations, or orders of any Governmental Entity, including without limitation IC.

\*\*\*

**3.A(9)** Ciel's Program Management for a Satellite shall apply the same degree of care as is normally applied by Ciel and its Affiliates to satellite construction efforts for the other satellites owned by Ciel and its Affiliates.

\*\*\*

**3.B. Customer's Representations, Warranties and Covenants.** Customer hereby represents, warrants and covenants to Ciel as follows:

**3.B(1)** It is a limited liability company duly organized, validly existing and in good standing under the laws of Colorado. It is duly licensed or qualified to do business as a foreign entity in all jurisdictions where the failure to be so qualified would materially adversely affect its ability to perform its obligations hereunder. It has all requisite power and authority to own its properties and carry on its business as now conducted.

**3.B(2)** The execution, delivery and performance (as provided herein) by Customer of this Agreement has been duly authorized by all requisite corporate action of Customer (including without limitation any necessary action of its directors and shareholders) and shall not violate any applicable provisions of law or any order of any court or agency of government and shall not conflict with or result in a breach under (a) its Articles of Incorporation or By-Laws, or (b) any material agreement to which Customer is a party or by which it is bound. This Agreement is a legal, valid and binding obligation of Customer, enforceable in accordance with its terms, except as limited by applicable bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting creditors' rights generally.

**3.B(3)** Customer has not employed or authorized anyone to represent it as a broker or finder in connection with this Agreement.

**3.B(4)** In connection with Customer's performance under this Agreement, Customer shall comply in all material respects with all applicable laws, regulations, or orders of any Governmental Entity, including without limitation those governing content of transmissions and all IC and FCC licence requirements.

**3.B(5)** Customer shall properly illuminate and shall use commercially reasonable efforts to cause third parties that Customer authorizes to use the Service to properly illuminate the Transponders.

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\*\*\*

#### ARTICLE 4. SERVICE RESPONSIBILITIES

**4.A. Laws and Regulations Governing Service.** Construction, launch, location and operation of the Satellite, Ciel's satellite system and Ciel's performance of all obligations pursuant to this Agreement are subject to all applicable laws and regulations of both Canada and the United States, including without limitation ITAR and EAR, the Radiocommunication Act and the Communications Act, the rules and regulations of IC and of the FCC, and coordination agreements with other operators and administrations. Customer's performance of all obligations pursuant to this Agreement is subject to all applicable laws and regulations of both Canada and the United States, including without limitation ITAR and EAR, the Radiocommunication Act and the Communications Act, the rules and regulations of IC and of the FCC, and coordination agreements with other operators and administrations.

#### **4.B. Use Conditions.**

**4.B(1)** Customer shall use the Service in accordance with (a) all applicable laws and regulations and (b) the conditions of use to be contained in a Commercial Operations Systems User's Guide to be agreed to by the parties (the "User's Guide"). Customer shall not use the Service for any unlawful purpose, \*\*\*. If Customer's non-compliance with the preceding two sentences causes or threatens, or other circumstances arise from Customer's use of the Service which cause or threaten, damage to the Satellite, \*\*\* Ciel may take actions (including suspension and/or restriction of Service) it reasonably believes necessary to ensure Customer's compliance with the User's Guide or Ciel's compliance with law. Ciel shall provide Customer with advance notice as soon as reasonably practicable prior to taking any such action; provided that the foregoing shall not preclude Ciel from taking prompt action to preserve its interests. Ciel shall also provide continuous monitoring of the Satellite in accordance with generally accepted industry standards.

\*\*\*

#### ARTICLE 5. OPERATIONAL MATTERS

**5.A. Service Access.** Customer is responsible for providing, operating and maintaining the equipment necessary to access the Satellite and Service. When signals are being transmitted from an earth station provided by Customer, Customer shall be responsible for proper illumination of the Transponders. Should improper illumination be detected by Ciel, Customer shall be notified and shall take corrective action promptly. Ciel shall be solely responsible for providing TT&C service for the Satellite, and shall perform TT&C service to customary industry standards (and to no less than a reasonable degree of care). Customer at its expense shall provide Ciel with any descrambling or decoding devices that may be required for signal monitoring. At a mutually agreed time, and prior to Customer transmitting from its earth station(s), Customer shall demonstrate to Ciel's designated Technical Operations Centre that its earth station(s) comply with the satellite access specifications contained in the User's Guide.

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## **5.B. Action to Protect Satellite and Access to Spare Equipment.**

**5.B(1) General.** Ciel shall have sole and exclusive control of operation of the Satellite. If circumstances occur which in Ciel's reasonable judgment pose a threat to the stable operation of the Satellite, Ciel shall have the right to take action it reasonably believes necessary to protect the Satellite, including discontinuance or suspension of operation of the Satellite or any Transponder, without any liability to Customer, except as otherwise set forth in this Agreement, \*\*\* If the discontinuance or suspension of operation is permanent, then, if the discontinuance applies to the entire Satellite, it shall be treated as a Satellite Failure for purposes of Section 2.C, and if the discontinuance applies to \*\*\*, it shall be treated as a Partial Loss or, if applicable, a Failed Payload for purposes of Section 2.C. Ciel shall give Customer as much notice as practical under the circumstances of any such discontinuance or suspension. If it becomes necessary to discontinue or suspend service \*\*\*

**6.C. Survival.** The provisions of this Article 6 shall survive expiration or termination of this Agreement indefinitely.

\*\*\*

**7.C. Survival.** The provisions of this Article 7 shall survive expiration or termination of this Agreement indefinitely.

## **ARTICLE 8. CONFIDENTIALITY AND NONDISCLOSURE**

**8.A. Certain Information Regarding Service.** Except for disclosures required by a court or governmental agency or to assignees permitted under Section 10.I, each party hereby agrees not to disclose to third parties (without the prior written consent of the other party) the material terms and conditions of this Agreement (including but not limited to the prices, payment terms, schedules, protection arrangements, and restoration provisions thereof), and all information provided to Customer and Ciel related to the design and performance characteristics of the Satellite, and any subsystems or components thereof, including the Transponders. Notwithstanding the foregoing, Customer (and not Ciel) may disclose to its third-party customers making use of the Service, and Ciel (and not Customer) may disclose to its third party vendors and contractors providing services relating to the Satellite \*\*\*, the Technical Performance Specifications, the User's Guide, and the protection arrangements and restoration provisions of the Service.

## **8.B. Proprietary Information.**

**8.B(1)** To the extent that either party discloses to the other any other information which it considers proprietary or is proprietary information of a third party, in written or tangible form, said party shall identify such information as proprietary when disclosing it to the other party by marking it clearly and conspicuously as proprietary information. Any proprietary disclosure to either party, if made orally, shall

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be identified as proprietary information at the time of disclosure, if the disclosing party wishes to keep such information proprietary under this Agreement. Any such information disclosed under this Agreement shall be used by the recipient thereof only in its performance under this Agreement.

**8.B(2)** Neither party shall be liable for the inadvertent or accidental disclosure of such information marked as proprietary, if such disclosure occurs despite the exercising of the same degree of care as the receiving party normally takes to preserve and safeguard its own proprietary information (but not less than reasonable care) or if such information (a) is or becomes lawfully available to the public from a source other than the receiving party before or during the period of this Agreement, (b) is released in writing by the disclosing party without restrictions, (c) is lawfully obtained by the receiving party from a third party or parties without obligation of confidentiality, (d) is lawfully known by the receiving party prior to such disclosure and is not subject to any confidentiality obligations, or (e) is at any time lawfully developed by the receiving party completely independently of any such disclosure or disclosures from the disclosing party.

**8.B(3)** In addition, neither party shall be liable for the disclosure of any proprietary information which it receives under this Agreement pursuant to judicial action or decree, or pursuant to any requirement of any Government or any agency or department thereof, having jurisdiction over such party, provided that in the reasonable opinion of counsel for such party such disclosure is required, and provided further that such party shall have given the other party notice, to the extent reasonably practical, prior to such disclosure.

\*\*\*

**8.C. Survival.** The provisions of this Article 8 are in addition to, and not in lieu of, any agreements of the parties regarding confidentiality executed by the parties on or before the date hereof and shall survive expiration or termination of this Agreement indefinitely.

## ARTICLE 9. TERMINATION

**9.A. Termination for Default.** In addition to any rights of termination provided in other Articles of this Agreement, either party may terminate this Agreement (a "Termination for Default") (such a termination by Customer constituting a Refund Eligible Termination) by giving the other party written notice thereof in the event: (1) the other party materially breaches this Agreement \*\*\* and fails to cure such breach within \*\*\* days after receipt of written notice thereof \*\*\*; or (2) the other party becomes insolvent or the subject of insolvency proceedings, including without limitation if the other party is judicially declared insolvent or bankrupt, or if any assignment is made of the other party's property for the benefit of its creditors or if a receiver, conservator, trustee in bankruptcy or other similar officer is appointed by a court of competent jurisdiction to take charge of all or any substantial part of the other party's property, or if a petition is filed by or against the other party under any provision of the Bankruptcy Act (Canada) or the Bankruptcy Code (U.S.) now or hereafter enacted, and such proceeding is not dismissed within sixty (60) days after filing, or if a petition is filed by the other party under any provision of the Bankruptcy Act (Canada) or the Bankruptcy Code (U.S.) now or hereinafter enacted. \*\*\*

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**9.D. Refunds.** In the event of the expiration of this Agreement pursuant to Section 9.F(1), or in the event of termination by Customer or wrongful termination by Ciel pursuant to this Agreement, Ciel shall refund any portion of the Charges paid by Customer to Ciel which relates to Service not provided by Ciel, and no further Charges or other amounts shall be due for the period following expiration or termination. By way of clarification, this Section 9.D shall not limit Customer's rights under this Agreement, at law, in equity or otherwise, in the event of Termination for Default or otherwise by Customer.

\*\*\*

**9.F. Expiration of Agreement/ Survival.**

\*\*\*

**9.F(2)** Neither party shall have any further obligations or liability to the other under this Agreement in the event of the termination or expiration of this Agreement in accordance with this Article 9, except for any obligations or liability (a) arising prior to such termination or expiration, (b) expressly arising upon or as a result of such termination or expiration, (c) expressly described in this Agreement as surviving such expiration or termination, or (d) arising as a result of or in connection with the representations and warranties in Article 3.

\*\*\*

**ARTICLE 10. GENERAL PROVISIONS**

**10.A. Force Majeure.** If a Force Majeure Event under this Agreement has occurred and is continuing, then the performance obligations of the party directly affected by such Force Majeure Event under this Agreement shall be tolled for the duration of such Force Majeure Event and such party shall not be liable to the other by reason of any delay or failure in performance of this Agreement which arises out of such Force Majeure Event; provided that the party directly affected by such Force Majeure Event shall promptly take and continue to take all reasonable actions to abate such Force Majeure Event as soon as possible. \*\*\* If Service is unavailable as a result of a Force Majeure Event affecting the Satellite, then Customer's obligation to pay the Charges shall be suspended during such period Service is unavailable and shall resume upon the Service becoming available.

**10.B. No Implied Licence.** Except to the extent that the Satellite and associated equipment are used for the Intended Purpose (or as otherwise set forth to the contrary in this Agreement) the provision of services or the conveying of any information under this Agreement shall not convey any licence by implication, estoppel or otherwise, under any patents or other intellectual property rights of Customer or Ciel, and their Affiliates, contractors and vendors \*\*\*.

**10.C. No Third-Party Rights; No Fiduciary Relationship.** This Agreement does not, is not intended to, and shall not be deemed or construed by the parties or by any third party to confer any enforceable rights or remedies on, or create any obligations or interests in, any person other than the signatories to this Agreement; or to create the relationship of principal and agent, partnership or joint venture or any other fiduciary relationship or association among the signatories to this Agreement.

**10.D. No Waiver; Remedies Cumulative.** No waiver, alteration, or modification of any of the terms of this Agreement shall be binding unless in writing and signed by all parties. All remedies and rights hereunder and those available in law or in equity shall be cumulative and the exercise by a party of any such right or remedy shall not preclude the exercise of any other right or remedy available under this Agreement in law or in equity.

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**10.E. Costs and Legal Fees.** In any action brought with respect to this Agreement by one party hereto against the other party hereto, in addition to any other money damages awarded by a court of competent jurisdiction, the prevailing party shall be entitled to recover from the other party its reasonable costs, including reasonable legal fees, in successfully bringing or defending against such action.

**10.F. Governing Law and Exclusive Jurisdiction.** This Agreement shall be governed by and interpreted in accordance with the laws \*\*\*

**10.H. Headings; Severability; Customer Purchase Orders.** All titles and headings in this Agreement are for reference purposes only; they shall not affect the meaning or construction of the terms of this Agreement. If any part or parts of this Agreement are held to be invalid, the remaining parts of the Agreement shall continue to be valid and enforceable. Customer agrees that any purchase order or other similar document that Customer may issue in connection with this Agreement shall be for Customer's internal purposes only and, therefore, even if acknowledged by Ciel, shall not in any way add to, subtract from, or in any way modify the terms and conditions of this Agreement.

\*\*\*

**10.J. Inter-Party Waiver.** Customer, on behalf of itself and its officers, employees, Affiliates, agents, insurers, owners and customers, agrees to accept the inter-party waiver and related indemnity provisions required by the applicable Launch Services Agreement for a launch, modified so as to apply to Customer and the launch services provider. Ciel likewise, on behalf of itself and its officers, employees, Affiliates, agents, insurers, owners and customers, agrees to accept the inter-party waiver and related indemnity provisions required by the applicable Launch Services Agreement for a launch, modified so as to apply to Ciel and the launch services provider. In no event shall such inter-party waiver and related indemnity provisions have any effect on the rights, obligations and liabilities of and between Customer and Ciel under this Agreement.

**10.K. Publicity.** Neither party shall in any way or in any form publicize or advertise in any manner this Agreement or the Services to be provided pursuant to this Agreement without the express written approval (which shall not be unreasonably withheld, conditioned or delayed) of the other party, obtained in advance, for each item of advertising or publicity. The foregoing prohibition shall include but not be limited to news releases, letters, correspondence, literature, promotional materials or displays of any nature or form. Each request for approval hereunder shall be submitted in writing to the representative designated in writing; and approval, in each instance, shall be effective only if in writing and signed by said representative. Nothing herein shall prevent either party from providing IC, the FCC, or any other Governmental Entity, information concerning this Agreement as required by law or in response to a request for information by such Governmental Entity, provided that the party providing such information shall have given the other party notice, to the extent reasonably practical, prior to such disclosure. Notwithstanding the foregoing, either party may refer to the fact that Ciel is providing the Service to

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Customer without the other party's prior approval so long as such statements are limited to a statement of such fact and are not an endorsement (positive or negative) of any product or service.

**10.L. ITAR/EAR.** Information exchanged under this Agreement may be subject to U.S. export control laws and regulations, such as the ITAR and the EAR. The parties agree that information subject to the export control laws and regulations shall not be disclosed or transferred to a third party without first obtaining written approval from the disclosing party and complying with all applicable U.S. export control laws and regulations.

**10.M. Currency.** All monetary amounts in this Agreement are expressed in U.S. dollars and shall be paid in U.S. dollars.

**10.N. Documents.** Subject to compliance with applicable legal requirements of Canada and the United States ( *e.g.* , ITAR and EAR), each party agrees to provide information and to execute, and if necessary to file with the appropriate Governmental Entities and international organizations, such documents as the other party shall reasonably request in order to carry out the purposes of this Agreement.

**10.O. Survival.** Neither party shall have any further obligations or liability to the other under this Agreement in the event of the termination or expiration of this Agreement, except for any obligations or liability (a) arising prior to such termination or expiration, (b) expressly arising upon or as a result of such termination or expiration, (c) expressly described in this Agreement as surviving such expiration or termination, (d) that logically would be expected to survive termination or expiration, or (e) arising as a result of or in connection with the representations, warranties and covenants in Article 3.

**10.P. Entire Agreement.** This Agreement contains the entire and exclusive understanding of the parties with respect to the subject matters hereof and, \*\*\*

## ARTICLE 11. DEFINITIONS

As used in this Agreement:

\*\*\*

C. “ Affiliate ” means, with respect to a party, any person or entity (1) more than 50% of the capital securities of which on an as-converted basis are owned by, or (2) directly or indirectly controlling, controlled by, or under common control with, such party at the time when the determination of affiliation is being made. For purposes of this definition, the term “control” (including the correlative meanings of the terms “controlled by” and “under common control with”), as used with respect to a person or entity, shall mean the possession, directly or indirectly, of the power to (a) direct or cause the direction of management policies of such person or entity, whether through the ownership of voting securities or by contract or otherwise, or (b) select a majority of the Board of Directors of such person or entity. \*\*\*

D. “ Agreement ” shall have the meaning specified in Section 1.A.

\*\*\*

H. “ Authorization ” means any authorization, order, permit, approval, forbearance decision, grant, licence, consent, right, franchise, privilege or certificate of any Governmental Entity of competent jurisdiction, whether or not having the force of law.

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\*\*\*

K. “ BSS ” means the Broadcasting-Satellite Service, as defined by the Radio Regulations of the ITU.

L. “ Business Day ” means Monday through Friday, 8:30 a.m. to 5:00 p.m. (local time in Ottawa, Ontario) exclusive of banking holidays observed in Ottawa.

\*\*\*

R. “ Ciel ” shall have the meaning specified in the preamble paragraph.

S. “ Ciel 2 Satellite ” shall have the meaning specified in Section 1A.

\*\*\*

U. “ Communications Act ” means the Communications Act of 1934 (United States), as amended.

V. “ Conditions of Licence ” shall have the meaning specified in Subsection 2.G(3).

\*\*\*

EE. “Customer” shall have the meaning specified in the preamble paragraph.

\*\*\*

JJ. “EAR” means the United States Export Administration Act and Export Administration Regulations, as amended.

KK. “Effective Date” shall have the meaning specified in the preamble paragraph.

LL. “End-of-Life” means the date on which, in Ciel’s reasonable judgment, the Satellite should be taken out of service because of insufficient fuel, \*\*\*

NN. “Extended Term” shall have the meaning specified in Section 1.C.

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\*\*\*

RR. “FCC” means the United States Federal Communications Commission and any successor agency thereto.

\*\*\*

UU. “Force Majeure Event” means acts of God, acts of the other party, acts of government authority, strikes or other labor disturbances, or any other cause beyond the reasonable control of that party, that (1) as to Ciel, relates to or affects its ability to provide the Service, (2) as to either party, relates to or affects that party’s ability to make a payment \*\*\*

VV. “Governmental Entity” means any (1) multinational, federal, provincial, state, municipal, local or other government, governmental or public department, central bank, court, commission, board, bureau, agency or instrumentality, domestic or foreign, (2) subdivision, agent, commission, board, or authority of any of the foregoing, or (3) quasi-governmental or private body validly exercising any regulatory, expropriation or taxing authority under or for the account of any of the foregoing, in each case in the proper exercise of its governmental authority.

\*\*\*

XX. “IC” means Canada’s Department of Industry and any successor agency thereto.

YY. “In-Service” means that the Satellite \*\*\* is deployed at the Orbital Location, and, following Ciel testing and verification of the entire satellite, Ciel determines in its reasonable business judgment that such satellite or all usable capacity thereof, is ready for commercial operation in accordance with the applicable Technical Performance Specifications, provided that the satellite is not a Satellite Failure. Ciel agrees that it shall provide written notice of such determination to Customer on the date that Ciel makes its determination.

ZZ. “In-Service Date” means the date on which the Satellite \*\*\* is In-Service.

AAA. “Initial Term” shall have the meaning specified in Section 1.C.

\*\*\*

NNN. “ITAR” means the United States Arms Export Control Act and International Traffic in Arms Regulations, as amended.

OOO. “ITU” means the International Telecommunication Union.

\*\*\*

UUU. “MRC” shall have the meaning specified in Subsection 2.B(1).

\*\*\*

ZZZ. “Partial Loss” means any failure of a Transponder to operate in accordance with the Technical Performance Specifications that does not result in a Satellite Failure.

\*\*\*

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BBBB. “Prime Rate” means the “prime rate” of interest as shown in the Money and Investing Section of the *Wall Street Journal* as of the applicable date.

\*\*\*

HHHH. “Regulatory Provisions” means all applicable requirements of the Communications Act and the published policies, rules, decisions, and regulations of the FCC, in each case as amended from time to time.

\*\*\*

KKKK. “RFP” means a request for proposal.

LLLL. “Satellite” means the Ciel-2 Satellite, \*\*\*

\*\*\*

ZZZZ. “Taxes” means taxes (including duties, fees or charges in the nature of taxes) levied by Governmental Authorities, \*\*\*.

AAAAA. “Technical Performance Specifications” means the technical performance criteria for the Service on the Ciel-2 Satellite.

\*\*\*

DDDDD. “Termination for Default” shall have the meaning specified in Section 9.A.

\*\*\*

IIII. “TT&C” means telemetry, tracking and control.

\*\*\*

KKKKK. “User’s Guide” shall have the meaning specified in Subsection 4.B(1).

\*\*\*

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IN WITNESS WHEREOF, the parties hereto have caused their duly authorized representatives to execute this agreement as of the Effective Date.

**ECHOSTAR SATELLITE L.L.C.**

By: \_\_\_\_\_  
(Signature)

Name: \_\_\_\_\_  
(Typed or Printed Name)

Title: \_\_\_\_\_  
\*\*\*

**CIEL SATELLITE  
COMMUNICATIONS INC.**

By: \_\_\_\_\_  
(Signature)

Name: \_\_\_\_\_  
(Typed or Printed Name)

Title: \_\_\_\_\_

\*\*\* Certain confidential portions of this exhibit were omitted by means of redacting a portion of the text. Copies of the exhibit containing the redacted portions have been filed separately with the Securities and Exchange Commission subject to a request for confidential treatment pursuant to Rule 24b-2 under the Securities Exchange Act.

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**End of Filing**

**AMENDMENT #1 TO  
SATELLITE SERVICE AGREEMENT FOR CIEL-2**

THIS AMENDMENT #1 ("Amendment #1") to the Satellite Service Agreement for Ciel-2 effective as of 19 August 2005 (the "Original Agreement"), between Ciel Satellite Limited Partnership ("Ciel") (as assignee of Ciel Satellite Communications Inc.), acting through its General Partner, Ciel Satellite Communications Inc., on the one hand, and EchoStar Satellite L.L.C. ("Customer")

on the other hand, is made effective as of 9 March 2006 (the "Amendment #1 Effective Date"). Defined terms used in this Amendment #1 have the meanings specified herein or in the Original Agreement. The Original Agreement as amended by this Amendment #1 is referred to as the "Agreement".

Ciel and Customer agree to amend the Original Agreement in accordance with the terms and conditions set forth below.

(1) Attachment A. The attached document entitled "Ciel-2 Technical Performance Specification" (dated 7 March 2006 and identified in the footer as "Ciel-2 TPS 060307, initial issue") is hereby incorporated into the Agreement as Attachment A.

(2)

(3)

(4) General. Except as expressly modified herein, the Original Agreement shall remain in full force and effect in accordance with its terms and conditions.



This Amendment #1 contains the complete and exclusive understanding of the parties with respect to the subject matter hereof and supersedes all prior negotiations and agreements between the parties with respect thereto.

ECHOSTAR SATELLITE L.L.C.

By: [Signature]  
(Signature)

Name: Charles W. Erpin  
(Typed or Printed Name)

Title: President & CEO

CIEL SATELLITE LIMITED PARTNERSHIP,  
acting through its General Partner, Ciel Satellite  
Communications Inc.,

By: [Signature]  
(Signature)

Name: KEVIN SMYTH  
(Typed or Printed Name)

Title: CEO

[REDACTED]

[Signature]

**ATTACHMENT D**  
Technical Narrative

# Ciel 2

## ATTACHMENT D

### Technical Narrative

#### A.1 Scope

This Attachment contains additional information required by Part 25.114 and other sections of the FCC Part 25 rules that are not entered into the Schedule S submission.

#### A.2 General Description of Overall System Facilities, Operations and Services [Part 25.114(d)(1)]

The Ciel 2 satellite will operate at the 128.85° W.L. orbital location in the 17.3-17.8 GHz BSS feeder uplink band (ITU Appendix 30A) and the 12.2-12.7 GHz BSS downlink band (ITU Appendix 30) using the 32 channel frequencies licensed by Industry Canada at this orbital location. The satellite will provide BSS services to Canada and all 50 states of the United States.

The satellite is equipped with two wide area beams, the Canadian and the CONUS beam, as well as 53 downlink spot beams covering most of the United States (including Alaska and Hawaii). Half of the downlink channels (17-32) will be used with the wide area beams, and the remaining 16 channels (channels 1-16) will be used with the spot beams.<sup>1</sup> Odd and even channel numbers operate in opposite circular polarizations. Channels 17-32 can be switched, transponder-by-transponder, between the Canadian and the CONUS beam. In total the satellite will exceed the Commission's frequency reuse requirements by a combination of polarization and spatial (spot beam) reuse.

Spot uplink beams are used for all uplink channels. For the uplink channels that are destined for the wide area CONUS downlink beam, there will be a spot uplink beam towards Cheyenne, WY and one towards Gilbert AZ. For the uplink channels that are destined for the Canadian downlink beam there will be three uplink spot beams towards Vancouver, Edmonton/Calgary and Montreal/Ottawa/Toronto. In addition, there will be uplink spot beams towards New Braunfels, TX; Mt. Jackson, VA; Spokane, WA and Monee, IL for channels that are destined for the spot downlink beams.

---

<sup>1</sup> Channel 17 is also switchable so that it can be used in the spot beams (or the wide area beams).

All beams on the Ciel 2 satellite have cross-polarization performance over the broadcast coverage area of each beam on the uplink and on the downlink that meets or exceeds 30 dB.

The Ciel 2 satellite includes 48 active and 18 spare linearized TWTAs: Of the active TWTAs, 16 are capable of 110W at saturated power and are dedicated to the spot beams; 16 are 130W saturated power and are dedicated to either the spot beams or the Canadian wide area beam, and 16 are 240W saturated power, dedicated to either the Canadian or CONUS wide area beams. The TWTAs used for the spot beams will each transmit multiple carriers, each of the same bandwidth as the broadcast beam carriers, shared among several of the downlink spot beams.

The CONUS downlink beam has a peak EIRP of 61.9 dBW and the Canadian downlink beam has a peak EIRP of 56.1 dBW. The carriers in the spot beams have different EIRP levels as a function of the rain zones, but the highest beam peak EIRP per carrier for any of the spot beams is 61.8 dBW.

Ciel will provide the Telemetry, Tracking and Command (TT&C) services for the satellite. The TT&C facility is located in Saskatoon, Saskatchewan, Canada and will be fully manned 24 hours a day and 7 days a week. In addition there will be a ground generated RF beacon transmitted from the Cheyenne, WY or Gilbert, AZ feeder link earth stations in the USA that will be used for satellite antenna pointing control.

### **A.3 Predicted Space Station Antenna Gain Contours** [Part 25.114(d)(3)]

The Ciel 2 satellite antenna gain contours for receive and transmit beams are given in GXT format and are embedded in the associated Schedule S submission.

### **A.4 Services to be Provided** [Part 25.114(d)(4)]

The satellite will provide a range of DBS services to tens of millions of small aperture receive-only terminals.

There will be one wideband digitally modulated carrier transmitted in each of the transponders in the CONUS beam, with either QPSK or 8PSK modulation. The Canadian beam will have either one or several wideband carriers per transponder. The spot beams will have multiple carriers of the same bandwidth as the CONUS carriers.

Representative link budgets, including details of the transmission characteristics, performance objectives and earth terminal characteristics, are provided in the Schedule S submission and further described in Section A.4.2 of this Attachment.

#### **A.4.1 Earth Stations**

The subscriber receive-only terminals to be used with this satellite will have effective antenna diameters of 45-75 cm, depending on the rain zone, number of feeds on the receive antenna, availability requirements, and location in the U.S. or Canada. The feeder links will have antenna diameters of 9 meters or greater.

#### **A.4.2 Link Budgets**

Three representative modulation/coding schemes are provided and embedded in the associated Schedule S:

- a) CONUS Beam: 8PSK rate 2/3
- b) South East Spot Beams: QPSK, Turbo Rate 5/6
- c) All other Spot Beams: 8PSK, Turbo Rate 2/3

#### **A.5 TT&C and Beacon Characteristics** [Parts 25.114(c)(4)(i) and 25.114(c)(9)]

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

The Ciel 2 TT&C sub-system provides for communications during pre-launch, transfer orbit and on-station operations, as well as during spacecraft emergencies. Consistent with FCC rules, the TT&C sub-system will operate at the edges of the uplink and downlink frequency ranges (*i.e.*, in the service bands) during all phases of the mission.

During transfer orbit and on-station emergencies, the TT&C signals will be received and transmitted by the satellite using a combination of antennas on the satellite that create a near omni-directional gain pattern. During normal on-station operation, the TT&C signals will be received and transmitted via a large-coverage horn antenna on the Earth (+Z) face of the spacecraft.

A summary of the TT&C sub-system characteristics is given in Table A5-1.



**Table A5-1: TT&C Performance Characteristics**

Command Modulation	PCM/BPSK/FM
Command/Ranging Frequencies	17308 MHz 17793.5 MHz
Uplink Flux Density	Between -76 and -60 dBW/m <sup>2</sup> during transfer orbit and on-station emergencies;  Between -92 and -60 dBW/m <sup>2</sup> during normal on-station mode.
Satellite Receive Antenna Types	Pseudo-omni antenna during transfer orbit and on-station emergencies;  Large-coverage horn antenna during on-station mode.
Polarization of Satellite Receive Antennas	<ul style="list-style-type: none"> <li>◦ LHCP and RHCP for pseudo-omni antenna;</li> <li>◦ LHCP and RHCP for large-coverage horn antenna.</li> </ul>
Peak Deviation (Command/Ranging)	± 400 kHz
Telemetry/Ranging Frequencies	12205 MHz 12209 MHz 12692.5 MHz 12698.5 MHz
Satellite Transmit Antenna Types	Pseudo-omni antenna during transfer orbit and on-station emergencies;  Shaped reflector communications antenna during on-station mode.
Polarization of Satellite Transmit Antennas	LHCP for pseudo-omni antennas;  RHCP and LHCP for shaped reflector antenna.
Maximum Downlink EIRP	10 dBW
Telemetry/Ranging Modulation Index:	
1 sub-carrier	1.0
2 sub-carrier	0.7

The satellite will be equipped with a high stability, high reliability PM/BPSK beacon receiver, which will permit the satellite to achieve precision pointing of its antenna towards the geographic areas being served. The characteristics of the PM/BPSK modulated carrier wave are identified in Table A.5-2.

**Table A.5-2 Precision Pointing Beacon Characteristics**

BPSK modulation waveform for beacon identification:	$\phi_{ld}(t) = m_{ld} \sin[\omega_{ld}(t) + \text{sig}(\text{bit}_{ld}) \cdot \pi/2]$
Output Frequency	17,798.5 MHz
BPSK sub-carrier frequency $\omega_{ld}$ :	16 kHz
$\omega_{ld}$ stability:	8 ppm
data rate $\text{sig}(\text{bit}_{ld})$ :	4 kbits/s
PCM waveform:	$\text{sig}(\text{bit}=0) = -1$ and $\text{sig}(\text{bit}=1) = 1$
Phase deviation $m_{ld}$ :	0.5 radian
PFD	-85 to -60 dBm

## A.6 Satellite Transponder Frequency Responses

[Part 25.114(c)(4)(vii)]

The predicted worst case receive and transmit channel filter response performance is given in Table A6-1 below. The receive response is measured from the satellite receive antenna up to the input of the LTWTA. The transmit response is measured from the input of the LTWTA to the satellite transmit antenna. Table A6-1 below indicates the frequency response:

**Table A6-1 Typical Regional Beam Receiver and Transmitter Filter Responses**

Frequency offset from channel center	Gain relative to channel center frequency (dB)		Comments
	Receive	Transmit	
CF±10 MHz	-0.2	-1.0	<u>In-Band</u> Value does not exceed these peak-to-peak values
CF±11 MHz	-0.35	-1.7	
CF±12 MHz	-0.7	-3.0	
CF±17.5 MHz	-12	-6	<u>Out-of-band</u> Attenuation is not less than these values
CF±20.2 MHz	-30	-14	
CF±27.2 MHz	-40	-22	

The frequency response of a spot beam, as measured from the input of the receive antenna to the output of the transmit antenna, shall not exceed 3.0 dB p-p over any 24 MHz span and over the entire bandwidth of the spot beam.

## A.7 Cessation of Emissions

[Part 25.207]

Each active satellite transmission chain (channel amplifiers and associated LTWTA) can be individually turned on and off by ground telecommand, thereby causing cessation of emissions from the satellite, as needed.

## **A.8 Interference Analysis**

[Part 25.114(d)(13)]

Annexes 1 to Appendices 30 and 30A set forth criteria for determining if another administration is affected by a proposed modification to the Region 2 BSS Plan. If an administration is found to be affected, then the agreement of that administration is sought through the procedures of the ITU. The Canadian administration will be responsible for coordinating the operation of the Ciel 2 satellite in accordance with these ITU procedures. Nevertheless, the results of the analyses required by Annex 1 to Appendix 30 and Annex 1 to Appendix 30A, using the precise technical characteristics of the Ciel 2 satellite, are contained in Appendix 1.

## **A.9 Orbital Debris Mitigation Plan**

### **A.9.1 Spacecraft Hardware Design**

Ciel has assessed and minimized the amount of debris released during normal operations. The satellite was specifically designed to minimize debris generated after separation from the launch vehicle and to cause no debris during normal on-station operations. All pyrotechnic devices onboard the satellite have been designed to retain all physical debris. The possibility of collisions with debris or micrometeoroids smaller than one centimeter was taken into account and the design of the spacecraft limits the effects of such collisions through the use of shielding, placement of components and the use of redundant systems to maintain spacecraft control. In addition, all sources of stored energy are located within the body of the spacecraft, providing protection from orbital debris.

### **A.9.2 Minimizing Accidental Explosions**

Ciel has assessed and limited the probability of accidental explosions during and after completion of mission operations. In designing the Ciel 2 satellite, the satellite manufacturer has taken steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. All propulsion subsystem pressure vessels, which have high margins of safety at launch, will have even higher margins in orbit, since use of propellants and pressurants during launch decreases the propulsion system pressure. Burst tests are performed on all pressure vessels during qualification testing to demonstrate a margin of safety against burst. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in

propellant and pressurization lines. All pressures, including those of the batteries, will be monitored by telemetry.

At the end of operational life, after the satellite has reached its final disposal orbit, on-board sources of stored energy will be depleted or secured, and the batteries will be discharged. The Ciel 2 propulsion system can vent its oxidizer and hydrazine tanks, but has no way to vent the helium tanks following the transfer orbit insertion. Once the spacecraft has been placed into its nominal orbit, two valves are permanently closed so that both of the helium tanks remain isolated. During and after operational life time, the risk of burst is mitigated to a negligible level for the following reasons:

1. The remaining pressure in the Helium (He) tanks (78 bars max) is significantly lower than the design burst pressure (465 bars) and the actual measured burst pressure (638 bars reached during qualification test). That offers a margin of 700% with respect to the qualification test and almost 500% over the design. Furthermore, the main parameter which can increase the pressure is the temperature. To get the tanks to a pressure above the design rupture pressure (465 bars), the tank temperature would have to increase to above 238°C (327°C for real burst pressure). This compares to the thermal analysis conducted for this satellite, which guarantees operating temperature lower than 40°C; a margin of 700% with respect to the qualification. These margins of the actual pressure and temperature versus either the design or qualification limits indicate that there is no risk of rupture.
2. Design of helium tanks: the tank is designed to be “leak before burst.”. It is made of a titanium liner and overwrapped with carbon fiber. So whatever the cause of the unexpected loss of pressure the tank will leak but not burst, in such a way that it will not generate debris.
3. In addition, the helium tanks are surrounded by panels in the satellite which protect them from thermal flux and external debris

Based on the foregoing technical design considerations, there is no risk of debris due to burst of the unvented helium tanks on the satellite, either during the initial transfer orbit after launch, or during the satellite’s life through to its disposal.

### **A.9.3 Safe Flight Profiles**

Ciel has assessed and limited the probability of the space station becoming a source of debris as a result of collisions with large debris or other operational space stations.

The proposed nominal orbital location for Ciel 2 is 129° W.L., which is presently occupied by Galaxy-27. As a result of a mutual understanding between Ciel and

the Galaxy-27 satellite operator, the Ciel 2 satellite will be operated at 128.85° W.L. at an offset of 0.15 from 129° W.L. This will ensure that the station-keeping volumes of the two satellites do not overlap and therefore that physical collision cannot occur.

Ciel is not aware of any other FCC licensed system, or any other system applied for and under consideration by the FCC, having an overlapping station-keeping volume with Ciel 2. Furthermore, Ciel is also not aware of any other system with an overlapping station-keeping volume with Ciel 2 that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

#### **A.9.4 Post Mission Disposal Plan**

At the end of the operational life of the Ciel 2 satellite, Ciel will maneuver the satellite to a disposal orbit with a minimum perigee of 350 km above the normal GSO operational orbit. This proposed disposal orbit altitude is based on the following calculation:

Total Solar Pressure Area "A" = 134.6 m<sup>2</sup>

"M" = Dry Mass of Satellite = 2593 Kg

"CR" = Solar Pressure Radiation Coefficient (worst case) = 2

Therefore, the Minimum Disposal Orbit Perigee Altitude:

$$= 235 \text{ km} + 1000 \times \text{CR} \times \text{A/m}$$

$$= 235 \text{ km} + 1000 \times 2 \times 134.6 / 2593$$

$$= 338.8 \text{ km}$$

$$= 338.8 \text{ km above GSO (35,786 km)}$$

Thus, the designed disposal orbit of 350 km above GSO exceeds the required minimum by a margin of 11.2 km. Maneuvering the satellite to the disposal orbit will require 17.4 kg of propellant, and this quantity of fuel, taking account of all fuel measurement uncertainties, will be reserved to perform the final orbit raising maneuvers.

**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/*

---

Zachary Rosenbaum, MSEE, BSc  
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4 Research Way  
Princeton, New Jersey 08540  
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**Appendix 1 to  
Attachment D (Technical Narrative)  
(CIEL 2)  
Analysis of ANNEX 1 of Appendix 30**

**1 Limits for the interference into frequency assignments in conformity with the Regions 1 and 3 Plan or with the Regions 1 and 3 List or into new or modified assignments in the Regions 1 and 3 List**

Not Applicable to Region 2.

**2 Limits to the change in the overall equivalent protection margin for frequency assignments in conformity with the Region 2 plan**

*With respect to § 4.2.3 c) of Article 4, an administration in Region 2 is considered as being affected if the overall equivalent protection margin corresponding to a test point of its entry in the Region 2 Plan, including the cumulative effect of any previous modification to that Plan or any previous agreement, falls more than 0.25 dB below 0 dB, or, if already negative, more than 0.25 dB below the value resulting from:*

- the Region 2 Plan as established by the 1983 Conference; or*
- a modification of the assignment in accordance with this Appendix; or*
- a new entry in the Region 2 Plan under Article 4; or any agreement reached in accordance with this Appendix. (WRC-03)*

The Ciel 2 satellite will operate under Canada's CAN-BSS7 ITU network filing at 129° W.L. The Administration of Canada is responsible for coordination of this network. The CAN-BSS7 network is a modification to the Region 2 BSS Plan and was published in AP30-30A/E/413 and /413 MOD-1.

An MSPACE analysis was performed using the ITU Reference Situation from IFIC 2559, as this includes the publication for the Canadian CAN-BSS7 network and the networks that predate it. The precise technical characteristics of the Ciel 2 satellite, which fall within the bounds of the CAN-BSS7 filing, were used for this MSPACE analysis. The results of this analysis are contained in Annex 1 to this Appendix.

**3 Limits to the change in the power flux-density to protect the broadcasting satellite service in Regions 1 and 2 in the band 12.2-12.5 GHz and in Region 3 in the band 12.5-12.7 GHz**

*With respect to § 4.2.3 a), 4.2.3 b) or 4.2.3 f) of Article 4, as appropriate, an administration in Region 1 or 3 is considered as being affected if the proposed*

*modification to the Region 2 Plan would result in exceeding the following power flux-density values, at any test point in the service area of its overlapping frequency assignments:*

- 147 dB(W/(m<sup>2</sup> · 27 MHz)) for 0° ≤ θ < 0.23°*
- 135.7 + 17.74 log θ dB(W/(m<sup>2</sup> · 27 MHz)) for 0.23° ≤ θ < 2.0°*
- 136.7 + 1.66 θ<sub>2</sub> dB(W/(m<sup>2</sup> · 27 MHz)) for 2.0° ≤ θ < 3.59°*
- 129.2 + 25 log θ dB(W/(m<sup>2</sup> · 27 MHz)) for 3.59° ≤ θ < 10.57°*
- 103.6 dB(W/(m<sup>2</sup> · 27 MHz)) for 10.57° ≤ θ*

*where θ is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies. (WRC-03)*

The closest BSS orbital location in Regions 1 and 3 is the MCO-BSS-40.5W network at 40.5° W.L., which is more than 88.5° from the 129 °W.L. orbital location and therefore the -103.6 dB(W/(m<sup>2</sup> · 27 MHz)) level from the above limits applies in this case. The GIMS Appendix 30 pfd tool was used to assess compliance with this Section. Using the antenna gain contour and power level of the Ciel 2 downlink beam, the GIMS pfd tool showed that no administrations are affected. Therefore the Ciel 2 satellite is compliant with this Section.

#### **4 Limits to the power flux-density to protect the terrestrial services of other Administrations**

*With respect to § 4.1.1 d) of Article 4, an administration in Region 1, 2 or 3 is considered as being affected if the consequence of the proposed modified assignment in the Regions 1 and 3 List is to increase the power flux-density arriving on any part of the territory of that administration by more than 0.25 dB over that resulting from that frequency assignment in the Plan or List for Regions 1 and 3 as established by WRC-2000. The same administration is considered as not being affected if the value of the power flux-density anywhere in its territory does not exceed the limits expressed below.*

*With respect to § 4.2.3 d) of Article 4, an administration in Region 1, 2 or 3 is considered as being affected if the consequence of the proposed modification to an existing assignment in the Region 2 Plan is to increase the power flux-density arriving on any part of the territory of that administration by more than 0.25 dB over that resulting from that frequency assignment in the Region 2 Plan at the time of entry into force of the Final Acts of the 1985 Conference. The same administration is considered as not being affected if the value of the power flux-density anywhere in its territory does not exceed the limits expressed below.*

*:*

- 148 dB(W/(m<sup>2</sup> · 4 kHz)) for θ ≤ 5°*



$$-148 + 0.5 (\theta - 5) \text{ dB}(W/(m^2 \cdot 4 \text{ kHz})) \text{ for } 5^\circ < \theta \leq 25^\circ$$

$$-138 \text{ dB}(W/(m^2 \cdot 4 \text{ kHz})) \text{ for } 25^\circ < \theta \leq 90^\circ$$

where  $\theta$  represents the angle of arrival. (WRC-03)

The GIMS pfd tool was used to determine the list of administrations whose terrestrial services may be affected by the Ciel 2 satellite at the 129°W orbital location. The GIMS results show that in both normal and high-power mode operations, no Regions 1 and 3 administrations are affected by Ciel 2.

**5 Limits to the change in the power flux-density of assignments in the Regions 1 and 3 Plan or List to protect the fixed-satellite service (space-to-Earth) in the band 11.7-12.2 GHz in Region 2 or in the band 12.2-12.5 GHz in Region 3, and of assignments in the Region 2 Plan to protect the fixed-satellite service (space-to-Earth) in the band 12.5-12.7 GHz in Region 1 and in the band 12.2-12.7 GHz in Region 3**

*With respect to § 4.1.1 e) of Article 4, an administration is considered as being affected if the proposed new or modified assignment in the Regions 1 and 3 List would result in an increase in the power flux-density over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 2 or Region 3 of 0.25 dB or more above that resulting from the frequency assignments in the Plan or List for Regions 1 and 3 as established by WRC-2000.*

*With respect to § 4.2.3 e), an administration is considered as being affected if the proposed modification to the Region 2 Plan would result in an increase in the power flux-density over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 1 or 3 of 0.25 dB or more above that resulting from the frequency assignments in the Region 2 Plan at the time of entry into force of the Final Acts of the 1985 Conference.*

*With respect to § 4.1.1 e) or 4.2.3 e) of Article 4, with the exception of cases covered by Note 1 below, an administration is considered as not being affected if the proposed new or modified assignment in the Regions 1 and 3 List, or if a proposed modification to the Region 2 Plan, gives a power flux-density anywhere over any portion of the service area of its overlapping frequency assignments in the fixed-satellite service in Region 1, 2 or 3 of less than:*

$$-186.5 \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) \text{ for } 0^\circ \leq \theta < 0.054^\circ$$

$$-164.0 + 17.74 \log \theta \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) \text{ for } 0.054^\circ \leq \theta < 2.0^\circ$$

$$-165.0 + 1.66 \theta_2 \text{ dB}(W/(m^2 \cdot 40 \text{ kHz})) \text{ for } 2.0^\circ \leq \theta < 3.59^\circ$$

$$-157.5 + 25 \log \theta \text{ dB}(W/(m_2 \cdot 40 \text{ kHz})) \text{ for } 3.59^\circ \leq \theta < 10.57^\circ$$

$$-131.9 \text{ dB}(W/(m_2 \cdot 40 \text{ kHz})) \text{ for } 10.57^\circ \leq \theta$$

where  $\theta$  is the minimum geocentric orbital separation in degrees between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies.

The GIMS pfd tool was used to verify compliance with this Section. All Regions 1 and 3 FSS satellites are greater than  $10.57^\circ$  from the  $129^\circ$  W.L. location, therefore the  $-131.9 \text{ dB}(W/(m_2 \cdot 40 \text{ kHz}))$  level applies. The results of the GIMS analysis shows that no administrations are affected by the Ciel 2 satellite operating at  $129^\circ$ W.L. Therefore the Ciel 2 satellite is compliant with this Section.

## **6 Limits to the change in equivalent noise temperature to protect the fixed-satellite service (Earth-to-space) in Region 1 from modifications to the Region 2 Plan in the band 12.5-12.7 GHz**

*With respect to § 4.2.3 e) of Article 4, an administration of Region 1 is considered as being affected if the proposed modification to the Region 2 Plan would result in:*

- the value of  $\Delta T / T$  resulting from the proposed modification is greater than the value of  $\Delta T / T$  resulting from the assignment in the Region 2 Plan as of the date of entry into force of the Final Acts of the 1985 Conference; and*
- the value of  $\Delta T / T$  resulting from the proposed modification exceeds 6%, using the method of Appendix 8 (Case II). (WRC-03)*

A review of the available ITU space network databases shows that there are no assignments registered in the Earth-to-space direction in the frequency band 12.5-12.7 GHz. Therefore no Region 1 space station can be affected by the Ciel 2 satellite operating at the  $129^\circ$  W.L. orbital location.

**Annex 1 to Appendix 1 to Attachment D**  
**Ciel 2**  
**MSPACE Results<sup>2</sup>**

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<sup>2</sup> Excludes Canadian registered networks, suppressed networks and those networks with which coordination is complete.

Adm	Beam_No	Beam_Name	Long_Nom	Aff_CHs	EPM_Dgr	Sat_Name
G	168	NDEC1E55	-55.5	21,29	0.25999999	INTELSAT KUEXT 304.5
G	170	NDEC1G55	-55.5	21,29	0.27000001	INTELSAT KUEXT 304.5
G	173	NDEC3G55	-55.5	21,29	0.36700001	INTELSAT KUEXT 304.5
G	174	NDEC3H55	-55.5	21,29	0.34099999	INTELSAT KUEXT 304.5
G	175	NDEC3I55	-55.5	21,29	0.38199999	INTELSAT KUEXT 304.5
G	185	NDEL1E55	-55.5	21,29	0.25699999	INTELSAT KUEXT 304.5
G	187	NDEL1G55	-55.5	21,29	0.26800000	INTELSAT KUEXT 304.5
G	190	NDEL3G55	-55.5	21,29	0.36399999	INTELSAT KUEXT 304.5
G	191	NDEL3H55	-55.5	21,29	0.35400000	INTELSAT KUEXT 304.5
G	192	NDEL3I55	-55.5	21,29	0.37900000	INTELSAT KUEXT 304.5
G	202	NDOC1E55	-55.5	25	0.25600001	INTELSAT KUEXT 304.5
G	204	NDOC1G55	-55.5	25	0.26800000	INTELSAT KUEXT 304.5
G	207	NDOC3G55	-55.5	17,25,30	0.36300000	INTELSAT KUEXT 304.5
G	208	NDOC3H55	-55.5	17,25,30	0.37000000	INTELSAT KUEXT 304.5
G	209	NDOC3I55	-55.5	17,25,30	0.37799999	INTELSAT KUEXT 304.5
G	219	NDOL1E55	-55.5	25	0.25799998	INTELSAT KUEXT 304.5
G	221	NDOL1G55	-55.5	25	0.27000001	INTELSAT KUEXT 304.5
G	224	NDOL3G55	-55.5	17,25,30	0.36599999	INTELSAT KUEXT 304.5
G	225	NDOL3H55	-55.5	17,25,30	0.35699999	INTELSAT KUEXT 304.5
G	226	NDOL3I55	-55.5	17,25,30	0.38199999	INTELSAT KUEXT 304.5
G	241	SAEC3G55	-55.5	18,20,22,24,26,28,30	0.26300001	INTELSAT KUEXT 304.5
G	242	SAEC3H55	-55.5	18,20,22,24,26,28,30	0.26499998	INTELSAT KUEXT 304.5
G	243	SAEC3I55	-55.5	18,20,22,24,26,28,30	0.26600000	INTELSAT KUEXT 304.5
G	258	SAEL3G55	-55.5	18,20,22,24,26,28,30	0.27099998	INTELSAT KUEXT 304.5
G	259	SAEL3H55	-55.5	18,20,22,24,26,28,30	0.27300000	INTELSAT KUEXT 304.5
G	260	SAEL3I55	-55.5	18,20,22,24,26,28,30	0.27399998	INTELSAT KUEXT 304.5
G	275	SAOC3G55	-55.5	19,21,23,25,27,29,31	0.31900000	INTELSAT KUEXT 304.5
G	276	SAOC3H55	-55.5	17,19,21,23,25,27,29,31	0.32899999	INTELSAT KUEXT 304.5
G	277	SAOC3I55	-55.5	17,19,21,23,25,27,29,31	0.33500000	INTELSAT KUEXT 304.5
G	292	SAOL3G55	-55.5	17,19,21,23,25,27,29,31	0.32600000	INTELSAT KUEXT 304.5
G	293	SAOL3H55	-55.5	19,21,23,25,27,29,31	0.33500000	INTELSAT KUEXT 304.5
G	294	SAOL3I55	-55.5	17,19,21,23,25,27,29,31	0.34200000	INTELSAT KUEXT 304.5
G	309	SDEC3G55	-55.5	18,20,22,24,26,28,30	0.27700001	INTELSAT KUEXT 304.5
G	310	SDEC3H55	-55.5	18,20,22,24,26,28,30	0.27599999	INTELSAT KUEXT 304.5
G	311	SDEC3I55	-55.5	18,20,22,24,26,28,30	0.27799999	INTELSAT KUEXT 304.5
G	326	SDEL3G55	-55.5	18,20,22,24,26,28,30	0.28600001	INTELSAT KUEXT 304.5
G	327	SDEL3H55	-55.5	18,20,22,24,26,28,30	0.28499999	INTELSAT KUEXT 304.5
G	328	SDEL3I55	-55.5	18,20,22,24,26,28,30	0.287	INTELSAT KUEXT 304.5
G	343	SDOC3G55	-55.5	17,19,21,23,25,27,29,31	0.33199998	INTELSAT KUEXT 304.5
G	344	SDOC3H55	-55.5	17,19,21,23,25,27,29,31	0.33899998	INTELSAT KUEXT 304.5
G	345	SDOC3I55	-55.5	17,19,21,23,25,27,29,31	0.34799999	INTELSAT KUEXT 304.5
G	357	SDOL1G55	-55.5	21,25	0.25099998	INTELSAT KUEXT 304.5
G	360	SDOL3G55	-55.5	17,19,21,23,25,27,29,31	0.338	INTELSAT KUEXT 304.5
G	361	SDOL3H55	-55.5	17,19,21,23,25,27,29,31	0.34499999	INTELSAT KUEXT 304.5
G	362	SDOL3I55	-55.5	17,19,21,23,25,27,29,31	0.35400000	INTELSAT KUEXT 304.5
G	1082	00008906	-123.5	1,3,5,7,9,11,13,15,17,19,21,23,25	4.05600023	IOMBSS-2
G	1083	00008907	-123.5	2,4,6,8,10,12,14,16,18,20,22,24	3.79699993	IOMBSS-2
HOL	1386	00010133	-114.5	4	0.33000001	SF_BSS5
HOL	1387	00010134	-114.5	3	0.25600001	SF_BSS5
MEX	103	MEX02SUR	-127.2	13,15	0.69700002	MEX02SUR
MEX	104	MEX02SUR	-126.8	4,14	0.74000001	MEX02SUR
USA	130	USAEH004	-118.8	18,20,22,24,26,28,30,32	0.29499998	USAEH004
USA	153	USABSS3	-119.2	5,7,17,19,21	0.55099999	USABSS-3
USA	160	USABSS4	-118.8	2,4,6,8,18,20	0.76599997	USABSS-4
USA	369	USABSS5A	-109.8	3,5,15	0.32800000	USABSS-5
USA	370	USABSS5B	-109.8	3,5,15	0.32800000	USABSS-5
USA	371	USABSS6A	-110.2	2,4,6,14,16	0.40700000	USABSS-6
USA	372	USABSS6B	-110.2	2,4,6,14,16	0.40799999	USABSS-6
USA	393	USABS9E4	-148	6,8,10,12	0.57400000	USABSS-9
USA	394	USABS9E6	-148	6,8,10,12	0.48800000	USABSS-9
USA	396	USABS9O4	-148	5,7,9,11	0.57099998	USABSS-9
USA	397	USABS9O6	-148	5,7,9,11	0.48500001	USABSS-9
USA	398	USBS10E2	-119	6,8,10,12	0.51800000	USABSS-10

Adm	Beam_No	Beam_Name	Long_Nom	Aff_CHs	EPM_Dgr	Sat_Name
USA	399	USBS10E4	-119	4,6,8,10,12	2.938999891	USABSS-10
USA	400	USBS10E6	-119	4,6,8,10,12	1.968000054	USABSS-10
USA	401	USBS10O2	-119	5,7,9,11	0.515999973	USABSS-10
USA	402	USBS10O4	-119	1,3,5,7,9,11,13	2.868999958	USABSS-10
USA	403	USBS10O6	-119	1,5,7,9,11,13	1.944000006	USABSS-10
USA	404	00003983	-118.8	2,4,6,8,18,20	0.765999973	USABSS-4
USA	409	USABSS3A	-119.2	1,5,7,11,15,17,19,21	0.991999984	USABSS-3
USA	410	USABSS3B	-119.2	5,7,15,17,19,21	0.797999978	USABSS-3
USA	411	USABSS3C	-119.2	5,7,17,19,21	0.444999993	USABSS-3
USA	412	USABSS4A	-118.8	2,4,6,8,14,18,20	1.292000055	USABSS-4
USA	413	USABSS4B	-118.8	2,4,6,8,14,16,18,20	1.225000024	USABSS-4
USA	414	USABSS4C	-118.8	18,20	0.574000001	USABSS-4
USA	418	00007342	-101.2	10	0.259000003	USABSS-1R
USA	419	00007343	-101.2	10	0.268999994	USABSS-1R
USA	420	00007344	-101.2	2,4,6,8,10,12,14,16	0.421999991	USABSS-1R
USA	421	00007345	-101.2	10	0.259999999	USABSS-1R
USA	422	00007346	-101.2	10	0.272000015	USABSS-1R
USA	423	00007347	-101.2	2,4,6,8,10,12,14,16	0.430000007	USABSS-1R
USA	425	00007349	-101.2	5,7,9	0.360000014	USABSS-1R
USA	426	00007350	-101.2	3,5,7,9,11,15	0.582000017	USABSS-1R
USA	428	00007352	-101.2	5,7,9	0.365999997	USABSS-1R
USA	429	00007353	-101.2	1,3,5,7,9,11,15	0.597999999	USABSS-1R
USA	431	00006250	-119.2	1,5,7,11,15,17,19,21	0.991999984	USABSS-3
USA	432	00006251	-119.2	5,7,15,17,19,21	0.797999978	USABSS-3
USA	433	00006252	-119.2	5,7,17,19,21	0.444999993	USABSS-3
USA	434	00006253	-118.8	2,4,6,8,14,18,20	1.292000055	USABSS-4
USA	435	00006254	-118.8	2,4,6,8,14,16,18,20	1.225000024	USABSS-4
USA	436	00006255	-118.8	18,20	0.574000001	USABSS-4
USA	437	00006683	-119	2,4,6,8,14,16,18,20	4.225999832	USABSS-12
USA	438	00006684	-119	2,4,6,14,16,18,20	1.271000028	USABSS-12
USA	439	00006685	-119	2,4,6,14,16,18,20	0.652000001	USABSS-12
USA	440	00006686	-119	1,3,5,7,13,15,17,19,21	2.085000038	USABSS-12
USA	441	00006687	-119	1,3,5,7,13,15,17,19,21	1.072000027	USABSS-12
USA	442	00006688	-119	1,3,5,7,13,15,17,21	0.546000004	USABSS-12
USA	443	00006861	-119	22,24,26,28,30,32	0.351000011	USABSS-7A
USA	465	00009197	-101.2	10	0.272000015	USABSS-13
USA	520	00007244	-119	2,4,6,8,10,12,14,16,18,20	3.305000067	USABSS-14
USA	521	00007245	-119	2,4,6,8,10,12,14,16,18,20	2.285000086	USABSS-14
USA	522	00007246	-119	2,4,6,8,10,12,14,16,18,20	0.999000013	USABSS-14
USA	523	00007247	-119	2,4,6,8,10,12,14,16,18	0.677999973	USABSS-14
USA	524	00007248	-119	11,13,15,17,19,21	1.585000038	USABSS-14
USA	525	00007249	-119	11,13,15,17,19,21	1.603999972	USABSS-14
USA	526	00007250	-119	11,13,15,17,19,21	0.841000021	USABSS-14
USA	527	00007251	-119	11,13,15,17,21	0.568000019	USABSS-14
USA	532	00007256	-119	9	1.414000034	USABSS-14
USA	533	00007257	-119	9	0.986000001	USABSS-14
USA	534	00007258	-119	9	0.441000015	USABSS-14
USA	535	00007259	-119	9	0.291999996	USABSS-14
USA	548	00007272	-119	5,7	0.559000015	USABSS-14
USA	549	00007273	-119	5,7	0.397000015	USABSS-14
USA	632	00007399	-61.5	17,19,21	0.400999993	USABSS-17
USA	633	00007400	-61.5	17,19,21	0.595000029	USABSS-17
USA	635	00007402	-61.5	24	0.257999986	USABSS-17
USA	732	00007499	-110	12,14,16,18,20	1.774999976	USABSS-15
USA	733	00007500	-110	12,14,16,18,20	1.511000037	USABSS-15
USA	734	00007501	-110	12,14,16,18,20	0.782999992	USABSS-15
USA	735	00007502	-110	12,14,16,18,20	0.444999993	USABSS-15
USA	736	00007503	-110	1,3,5,7,9,11,13,15,17	1.526999995	USABSS-15
USA	737	00007504	-110	1,3,5,7,9,11,13,15,17	1.353000045	USABSS-15
USA	738	00007505	-110	1,3,5,7,9,11,13,15,17	0.824999988	USABSS-15
USA	739	00007506	-110	3,5,7,9,11,15	0.490000001	USABSS-15
USA	792	00007559	-110	8	0.314000001	USABSS-15
USA	793	00007560	-110	8	0.287	USABSS-15
USA	796	00007563	-110	4	1.970999956	USABSS-15
USA	797	00007564	-110	4	1.687000036	USABSS-15
USA	798	00007565	-110	4	0.890999973	USABSS-15
USA	799	00007566	-110	4	0.512000024	USABSS-15
USA	1220	00009252	-110	28,30,32	0.316000015	USABSS-16
USA	1271	00010034	-100.85	9	0.347999999	USABSS-19
USA	1409	00010000	-101	20,28	0.256999999	USABSS-21
USA	1416	00010007	-101	26	0.282000005	USABSS-21

**Appendix 2 to  
Attachment D (Technical Narrative)  
(Ciel 2)  
Analysis of ANNEX 1 of Appendix 30A**

**1 Limits to the change in the overall equivalent protection margin with respect to frequency assignments in conformity with the Region 2 feeder-link Plan** (WRC-2000)

*With respect to the modification to the Region 2 feeder-link Plan and when it is necessary under this Appendix to seek the agreement of any other administration of Region 2, except in cases covered by Resolution 42 (Rev.WRC-03), an administration is considered as being affected if the overall equivalent protection margin corresponding to a test point of its entry in that Plan, including the cumulative effect of any previous modification to that Plan or any previous agreement, falls more than 0.25 dB below 0 dB, or, if already negative, more than 0.25 dB below the value resulting from:*

- the feeder-link Plan as established by the 1983 Conference; or*
  - a modification of the assignment in accordance with this Appendix; or*
  - a new entry in the feeder-link Plan under Article 4; or*
- any agreement reached in accordance with this Appendix except for Resolution 42 (Rev.WRC-03). (WRC-03)*

See the results described under Appendix 1 to Attachment D Section 2 “the Appendix 30 Annex 1 Analysis”.

**2 Limits to the interference into frequency assignments in conformity with the Regions 1 and 3 feeder-link Plan or with the Regions 1 and 3 feeder-link List or proposed new or modified assignments in the Regions 1 and 3 feeder-link List** (WRC-03)

Not Applicable to Region 2.

**3 Limits applicable to protect a frequency assignment in the bands 17.3-18.1 GHz (Regions 1 and 3) and 17.3-17.8 GHz (Region 2) to a receiving space station in the fixed-satellite service (Earth-to-space)**

*An administration in Region 1 or 3 is considered as being affected by a proposed modification in Region 2, with respect to § 4.2.2 a) or 4.2.2 b) of Article 4, or an administration in Region 2 is considered as being affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List, with respect to § 4.1.1 c) of Article 4, when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder-link would cause an increase in the*

*noise temperature of the feeder-link space station which exceeds the threshold value of  $\Delta T / T$  corresponding to 6%, where  $\Delta T / T$  is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the feederlink carriers. (WRC-03)*

The following Table shows the  $\Delta T / T$  for the closest Regions 1 and 3 feeder link space stations. It can be seen that the  $\Delta T / T$  levels are well below the allowed 6% level. Therefore the Ciel 2 satellite at the 129°W orbital location is in conformity with this Section.

Closest Region 1 or 3 Feeder Link Space Station			E/S Lat (°N)	E/S Long (°E)	Range (km)	E/S Gain towards Victim Satellite (dBi)	Victim Satellite Rx System Noise Temp (K)	Calculated $\Delta T / T$ (%)
Beam Name	Orbital Position	Receive Antenna Gain (dBi)						
OCE10100	-160	1.87	39.99	-106.11	39684	-6.18	600	6.02E-05
OCE10100	-160	1.87	34.10	-111.94	38987	-6.37	600	6.24E-05
OCE10100	-160	1.87	28.76	-99.70	39800	-6.20	600	5.99E-05
OCE10100	-160	1.87	43.10	-85.73	41365	-5.75	600	5.54E-05
OCE10100	-160	1.87	47.96	-118.49	39344	-6.20	600	6.13E-05
SM005700	-178	-1.1	39.99	-106.11	41103	-10.00	600	1.21E-05
SM005700	-178	-1.1	34.10	-111.94	40458	-10.00	600	1.25E-05
SM005700	-178	0	28.76	-99.70	41496	-10.00	600	1.53E-05
SM005700	-178	-1	47.96	-118.49	40433	-10.00	600	1.28E-05
FJI19300	-178	0.04	39.99	-106.11	41103	-10.00	600	1.58E-05
FJI19300	-178	0.05	34.10	-111.94	40458	-10.00	600	1.63E-05
FJI19300	-178	0.04	28.76	-99.70	41496	-10.00	600	1.55E-05
FJI19300	-178	0.04	47.96	-118.49	40433	-10.00	600	1.63E-05
MCO-BSS-40.5W	-40.5	5.9	39.99	-106.11	40588	-10.00	600	6.24E-05
MCO-BSS-40.5W	-40.5	5.9	34.10	-111.94	40937	-10.00	600	6.13E-05
MCO-BSS-40.5W	-40.5	5.9	28.76	-99.70	39701	-10.00	600	6.52E-05
MCO-BSS-40.5W	-40.5	5.9	43.10	-85.73	39257	-10.00	600	6.67E-05
MCO-BSS-40.5W	-40.5	5.9	38.44	-80.51	38666	-10.00	600	6.87E-05

**4 Limits applicable to protect a frequency assignment in the band 17.8-18.1 GHz (Region 2) to a receiving feeder-link space station in the fixed-satellite service (Earth-to-space) (WRC-03)**

*With respect to § 4.1.1 d) of Article 4, an administration is considered affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder-link in Region 2 of that administration would cause an increase in the noise temperature of the receiving feeder-link space station which exceeds the threshold value of  $\Delta T/T$  corresponding to 6%, where  $\Delta T/T$  is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of the feeder-link carriers. (WRC-03)*

Not Applicable to Region 2.



**Appendix 3:**  
**Link Budgets**

## Link Budget:

### CONUS Beam: 8PSK rate 2/3

DATA RATE	38333.96	kbps	sat	BSS129	UPLINK SITE	
NUMBER OF PHASES	8		xpdr	CONUS	UPLINK SFD	-99.00 dBW/m2
LDPC	2/3		loc	-129.0	ATTENUATOR	10.0 dB
SPECTRAL EFFICIENCY	1.916698				UPLINK G/T	5.00 dB/K
REQUIRED Eb/No	4.40	dB			UPLINK FREQ	17300.00 MHz
IF BANDWIDTH	20000.0	kHz			DOWNLINK FREQ	12200.00 MHz
C/N REQUIRED	7.20	dB			UPLINK EIRP	73.5 dBW
Faded System Margin	0.3	dB			Uncompensated U/L Fade	0.0 dB
Antenna Efficiency	63.00%				UPLINK C/N+I	24.0 dB
Spacing Factor	1.2				Adjacent satellite C/I	20
Required Bandwidth	24.000	MHz				99.0
Allocated Bandwidth	24.000	MHz			Transponder Bandwidth	24.0 MHz
Transponder SCPC IBO	0.0	dB			Required Bandwidth	100.00 %
Transponder SCPC OBO	0.0	dB			Allocated Bandwidth	100.00 %
Carrier IBO	0.00	dB			Carrier Allocated Power	100.00 %
Carrier OBO	0.00	dB				

	ANT	ES	ANT	Assumed	MINIMUM	XPDR		CLEAR-SKY	MARGIN
RECEIVE SITE	DIA	Tsys	G/T	C/I	C/N	SAT	CXR	DOWNLINK	TO
	(m)	(K)	(dB/K)	(dB)	DOWN	EIRP	EIRP	C/N	MIN C/Ndn
					(dB)	(dBW)	(dBW)	(dB)	(dB)
ATLANTA GA	0.50	105.0	13.6	20.0	7.9	55.80	55.80	19.0	11.2
PHOENIX AZ	0.50	105.0	13.6	20.0	7.9	51.50	51.50	15.1	7.2
LOS ANGELES CA	0.50	105.0	13.6	20.0	7.9	51.10	51.10	14.7	6.8
SAN FRANCISCO CA	0.50	105.0	13.6	20.0	7.9	52.80	52.80	16.3	8.5
DENVER CO	0.50	105.0	13.6	20.0	7.9	51.40	51.40	14.8	7.0
CHICAGO IL	0.50	105.0	13.6	20.0	7.9	53.70	53.70	16.9	9.0
SEATTLE WA	0.50	105.0	13.6	20.0	7.9	52.70	52.70	16.1	8.2
MIAMI	0.50	105.0	13.6	20.0	7.9	57.90	57.90	21.2	13.0

## Link Budget:

### South East Spot Beams: QPSK, Turbo Rate 5/6

DATA RATE	31698.48	kbps	sat	BSS129	UPLINK SITE				
NUMBER OF PHASES	4		xpdr	1	UPLINK SFD	-99.00 dBW/m2			
LDPC	5	6	loc	-129.0	ATTENUATOR	10.0 dB			
SPECTRAL EFFICIENCY	1.584924				UPLINK G/T	5.00 dB/K			
REQUIRED Eb/No	3.70	dB			UPLINK FREQ	17300.00 MHz			
IF BANDWIDTH	20000.0	kHz			DOWNLINK FREQ	12200.00 MHz			
C/N REQUIRED	5.70	dB			UPLINK EIRP	73.5 dBW			
Faded System Margin	0.3	dB			Uncompensated U/L Fade	0.0 dB			
Antenna Efficiency	63.00%				UPLINK C/N	25.1 dB			
Spacing Factor	1.2								
Required Bandwidth	24.000	MHz			Transponder Bandwidth	24.0 MHz			
Allocated Bandwidth	24.000	MHz			Required Bandwidth	100.00 %			
Transponder SCPC IBO	0.0	dB			Allocated Bandwidth	100.00 %			
Transponder SCPC OBO	0.0	dB			Carrier Allocated Power	100.00 %			
Carrier IBO	0.00	dB							
Carrier OBO	0.00	dB							
0.45									
RECEIVE SITE	ANT	ES	ANT	Assumed	MINIMUM	XPDR		CLEAR-SKY	MARGIN
	DIA	Tsys	G/T	C/I	C/N	SAT	CXR	DOWNLINK	TO
	(m)	(K)	(dB/K)	(dB)	DOWN	EIRP	EIRP	C/N	MIN C/Ndn
					(dB)	(dBW)	(dBW)	(dB)	(dB)
TAMPA FL	0.50	105.0	13.6	12.9	7.1	56.30	56.30	19.5	12.5
ST PETERSBURG FL	0.50	105.0	13.6	12.9	7.1	56.30	56.30	19.6	12.5
SARASOTA FL	0.50	105.0	13.6	12.9	7.1	56.30	56.30	19.6	12.5
CHARLESTON SC	0.50	105.0	13.6	12.9	7.1	56.30	56.30	19.5	12.4
NEW ORLEANS LA	0.50	105.0	13.6	12.9	7.1	56.30	56.30	19.6	12.6
HOUSTON TX	0.50	105.0	13.6	12.9	7.1	56.30	56.30	19.7	12.7

## Link Budget:

### All other Spot Beams: 8PSK, Turbo Rate 2/3

DATA RATE	38333.96	kbps	sat	BSS129	UPLINK SITE	
NUMBER OF PHASES	8		xpdr	Spot Beams exl SE	UPLINK SFD	-99.00 dBW/m2
LDPC	2	3	loc	-129.0	ATTENUATOR	10.0 dB
SPECTRAL EFFICIENCY	1.916698				UPLINK G/T	5.00 dB/K
REQUIRED Eb/No	4.40	dB			UPLINK FREQ	17300.00 MHz
IF BANDWIDTH	20000.0	kHz			DOWNLINK FREQ	12200.00 MHz
C/N REQUIRED	7.20	dB			UPLINK EIRP	73.5 dBW
Faded System Margin	0.3	dB			Uncompensated U/L Fade	0.0 dB
Antenna Efficiency	63.00%				UPLINK C/N+I	24.0 dB
Spacing Factor	1.2				Adjacent satellite C/I	20
Required Bandwidth	24.000	MHz			Spot beam C/I	13.5
Allocated Bandwidth	24.000	MHz				
Transponder SCPC IBO	0.0	dB			Transponder Bandwidth	24.0 MHz
Transponder SCPC OBO	0.0	dB			Required Bandwidth	100.00 %
Carrier IBO	0.00	dB			Allocated Bandwidth	100.00 %
Carrier OBO	0.00	dB			Carrier Allocated Power	100.00 %

RECEIVE SITE	ANT DIA (m)	ES Tsyst (K)	ANT G/T (dB/K)	Assumed C/I (dB)	MINIMUM C/N DOWN (dB)	XPDR SAT EIRP (dBW)	CXR EIRP (dBW)	CLEAR-SKY DOWNLINK C/N (dB)	MARGIN TO MIN C/Ndn (dB)
HONOLULU HI	0.50	120.0	13.5	12.6	9.2	51.00	51.00	14.6	5.4
SAN ANTONIO TX	0.50	105.0	13.6	12.6	9.2	53.60	53.60	17.1	7.8
ATLANTA GA	0.50	105.0	13.6	12.6	9.2	55.00	55.00	18.2	9.0
NASHVILLE TN	0.50	105.0	13.6	12.6	9.2	55.00	55.00	18.2	9.0
EL PASO TX	0.50	105.0	13.6	12.6	9.2	50.10	50.10	13.6	4.4
LAS CRUCES NM	0.50	105.0	13.6	12.6	9.2	50.00	50.00	13.5	4.3
SHREVEPORT LA	0.50	105.0	13.6	12.6	9.2	56.30	56.30	19.7	10.4
PHOENIX AZ	0.50	105.0	13.6	12.6	9.2	50.40	50.40	14.0	4.7
PRESCOTT AZ	0.50	105.0	13.6	12.6	9.2	50.00	50.00	13.6	4.3
OKLAHOMA CITY OK	0.50	105.0	13.6	12.6	9.2	53.10	53.10	16.5	7.3
LOS ANGELES CA	0.50	105.0	13.6	12.6	9.2	50.00	50.00	13.6	4.4
WASHINGTON DC	0.50	105.0	13.6	12.6	9.2	54.80	54.80	17.9	8.6
HAGERSTOWN MD	0.50	105.0	13.6	12.6	9.2	54.80	54.80	17.9	8.6
ST LOUIS MO	0.50	105.0	13.6	12.6	9.2	53.80	53.80	17.1	7.8
SAN FRANCISCO CA	0.50	105.0	13.6	12.6	9.2	50.50	50.50	14.0	4.8
OAKLAND CA	0.50	105.0	13.6	12.6	9.2	50.50	50.50	14.0	4.8
SAN JOSE CA	0.50	105.0	13.6	12.6	9.2	50.30	50.30	13.9	4.6
DENVER CO	0.50	105.0	13.6	12.6	9.2	50.30	50.30	13.7	4.5
SALT LAKE CITY UT	0.50	105.0	13.6	12.6	9.2	49.10	49.10	12.5	3.3
CLEVELAND OH	0.50	105.0	13.6	12.6	9.2	53.80	53.80	16.9	7.7
AKRON OH	0.50	105.0	13.6	12.6	9.2	53.80	53.80	16.9	7.7
CANTON OH	0.50	105.0	13.6	12.6	9.2	54.30	54.30	17.4	8.2
CHICAGO IL	0.50	105.0	13.6	12.6	9.2	53.40	53.40	16.6	7.3
BOISE ID	0.50	105.0	13.6	12.6	9.2	49.50	49.50	12.9	3.7
MARQUETTE MI	0.50	105.0	13.6	12.6	9.2	52.70	52.70	15.8	6.6
MINNEAPOLIS MN	0.50	105.0	13.6	12.6	9.2	53.20	53.20	16.4	7.2
ST PAUL MN	0.50	105.0	13.6	12.6	9.2	53.20	53.20	16.4	7.2
SEATTLE WA	0.50	105.0	13.6	12.6	9.2	51.00	51.00	14.4	5.1
TACOMA WA	0.50	105.0	13.6	12.6	9.2	51.00	51.00	14.4	5.1
PORTLAND OR	0.50	105.0	13.6	12.6	9.2	51.00	51.00	14.4	5.2
GREAT FALLS MT	0.50	105.0	13.6	12.6	9.2	49.50	49.50	12.8	3.6
MINOT ND	0.50	105.0	13.6	12.6	9.2	52.10	52.10	15.3	6.1
BISMARCK ND	0.50	105.0	13.6	12.6	9.2	52.00	52.00	15.3	6.0
DICKINSON ND	0.50	105.0	13.6	12.6	9.2	52.00	52.00	15.3	6.0
ANCHORAGE AK	0.50	105.0	13.6	12.6	9.2	51.70	51.70	14.7	5.5
CORPUS CHRISTI TX	0.50	105.0	13.6	12.6	9.2	53.80	53.80	17.3	8.1
LUBBOCK TX	0.50	105.0	13.6	12.6	9.2	50.40	50.40	13.9	4.6
BAKERSFIELD CA	0.50	105.0	13.6	12.6	9.2	50.00	50.00	13.6	4.3
INDIANAPOLIS IA	0.50	105.0	13.6	12.6	9.2	53.90	53.90	17.2	7.9
TOPEKA KS	0.50	105.0	13.6	12.6	9.2	53.00	53.00	16.3	7.1
SIOUX FALLS SD	0.50	105.0	13.6	12.6	9.2	53.00	53.00	16.3	7.0
EUGENE OR	0.50	105.0	13.6	12.6	9.2	50.00	50.00	13.4	4.2
IDAHO FALLS ID	0.50	105.0	13.6	12.6	9.2	49.80	49.80	13.2	4.0
FARGO ND	0.50	105.0	13.6	12.6	9.2	52.10	52.10	15.3	6.1
SPOKANE WA	0.50	105.0	13.6	12.6	9.2	50.40	50.40	13.7	4.5