EXHIBIT 43
DG Consents Sub, Inc.
Modification Application
FCC Form 312
November 2010

Description of Modification of License Application

In this Modification of License Application, DG Consents Sub, Inc. ("DigitalGlobe") proposes to modify the orbit characteristics of the longest-operating satellite in its three-satellite non-geostationary satellite orbit ("non-GSO") Earth Exploration-Satellite Service ("EESS") system. Specifically, DigitalGlobe proposes to increase the orbital altitude of its QuickBird satellite to 496 kilometers from its present altitude of 450 kilometers. No changes are proposed in this Modification Application to either the WorldView 60 or the WorldView 110 satellites in DigitalGlobe's non-GSO EESS system.

QuickBird, authorized in 1997 as QuickBird-2 and launched in 2001,[1] has been the cornerstone of DigitalGlobe's constellation for nearly a decade. With the addition of the two WorldView satellites in recent years, DigitalGlobe is able to produce a substantially greater volume of remote sensing data in a shorter time frame than was possible with QuickBird alone. Still, QuickBird remains a vital and integral part of the DigitalGlobe constellation. DigitalGlobe has determined that with a 46 kilometer increase in the orbital altitude of the near-circular QuickBird satellite, the mission life of the spacecraft can be extended by more than one year.

The proposed increase in orbit altitude will cause no increase in the interference envelope for QuickBird. Indeed, as the current power levels from the spacecraft will be maintained but from a higher altitude, there will be a reduction in power flux density levels on the Earth's surface from levels that already meet the international limits established for the 8025-8400 MHz band. All other parameters of the authorized, in-orbit satellite are unchanged.

The Commission has determined in previous cases involving non-GSO satellites in other services that increases in orbit altitudes (and associated changes in such related parameters as inclination angles) are not considered to be major unless they increase the potential for interference.[2] Those same principles apply to the change in orbital configuration of the QuickBird satellite that DigitalGlobe proposes in this Application.

DigitalGlobe also notes that observations the Commission previously made with respect to a pre-launch orbit altitude change for the QuickBird satellite remain true today. In May 2001,

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[1] *See EarthWatch Incorporated*, 12 FCC Rcd 21647 (Int'l Bur. 1997) ("*EarthWatch")*. QuickBird-2 eventually became known simply as QuickBird following the loss of the authorized QuickBird-1 satellite in a launch failure.

[2] *See, e.g., Orbital Communications Corp.,* 13 FCC Rcd 10828, (¶¶ 23-24) (Int'l. Bur. 1998); *Teledesic Corp.*, 14 FCC Rcd 2261 (¶ 13) (Int'l. Bur. 1999) (changes in orbital configuration, including number of satellites, number of planes, orbit altitude and inclination angle, not considered major without increase in interference to other systems or increase in difficulty in sharing).

EarthWatch Incorporated (the former name of DigitalGlobe's parent corporation) sought to lower the authorized orbit altitude of QuickBird from 600 kilometers to its current 450 kilometer range. In assessing this proposed reduction, the Commission noted that "spacecraft design decisions should be left to each space station licensee, because the licensee is in a better position to determine how to tailor its system to meet the particular needs of its customer base."[3] It went on to state that where an orbit altitude change is technically efficient, permits additional entrants, and is otherwise in the public interest, the Commission will approve the change.[4]

DigitalGlobe's current proposal readily meets this three-pronged standard. First, the altitude change is technically efficient. The increase in altitude will extend the operational life of the QuickBird satellite. Moreover, the power flux density values for the downlink bands remain within the regulatory limits established in No. 21.16 of the International Telecommunication Union's Radio Regulations. The altitude increase in this case (as opposed to the decrease proposed in 2001) will, in fact, mean a reduction in power flux density at the Earth's surface.[5]

Second, nothing in this proposal has any impact on additional EESS entry into the 8025-8400 MHz band. To the extent that the altitude change may make QuickBird's network more susceptible to interference, DigitalGlobe commits not to claim any greater protection from harmful interference than it is entitled to claim with the satellite at an orbital altitude of 450 kilometers.

Finally, the grant of this Modification Application will permit DigitalGlobe to extend the operational life of the QuickBird satellite by up to fifteen months. The data generated by DigitalGlobe's three-satellite system will continue to advance myriad public and national interests such as meteorology, national security, and improved understanding of our environment and climate. Moreover, competition in the market for commercial remote sensing data will continue to be robust.

A Schedule S submission containing the appropriate information for the QuickBird satellite at its proposed increased orbit is included with this Modification Application. All other parameters of the authorized, in-orbit satellite are unchanged.[6]

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[3] *EarthWatch Incorporated*, 16 FCC Rcd 15985, 15986 (Int'l Bur. 2001) ("*EarthWatch Modification")*.

[4] *EarthWatch Modification,* .16 FCC Rcd at 15987.

[5] DigitalGlobe includes an updated interference analysis in Attachment B to this exhibit. The analysis is very similar to the one included in Attachment 1 to the March 2001 EarthWatch Incorporated Modification Application that led to the establishment of QuickBird's orbital altitude at the 450-470 km range, but shows slightly lower power flux-density values. *See* Modification of Authorization for EarthWatch Incorporated, File No. SAT-MOD-20010322-00028.

[6] Technical and Schedule S information is provided for QuickBird only, and not for the DigitalGlobe non-GSO EESS system as a whole. Previous technical submissions for the WorldView satellites are unaffected by the instant orbit modification proposal for QuickBird. *See, e.g.*, Application of DG Consents Sub, Inc. for Modification of License to Revise Orbital Paramters of WorldView-60 and Add WorldView-110 to the DigitalGlobe Constellation, File No. SAT-MOD-20070730-00107 ("DigitalGlobe 2007 Modification Application"), Stamp Grant, October 4, 2007 ("DigitalGlobe 2007 Modification Stamp Grant").

As has been determined with respect to prior modifications of the instant system license in the years following the Commission's adoption of the first-come/first-served and modified processing round procedures, this Modification Application is to be considered under the first-come/first-served procedure adopted in the Commission's *Space Station Licensing Reform* proceeding.[7] The rationale underlying these earlier determinations – in particular, the fact that DigitalGlobe's EESS system, unlike some other types of non-geostationary satellite orbit systems, can share the frequency bands with other EESS systems – remains fully applicable to the QuickBird satellite's proposed operations in a slightly higher orbit.[8] DigitalGlobe urges the Commission to follow the precedent it established for non-GSO EESS modification applications in the *DigitalGlobe Order*, and treat DigitalGlobe's instant Modification Application under the first-come/first-served processing procedure.[9]

Finally, DigitalGlobe urges expedited favorable consideration of this Modification Application. The changes proposed to the orbit of the QuickBird satellite are needed to preserve and extend the spacecraft's useful life and its important imaging mission (which has national ramifications that extent beyond DigitalGlobe's proprietary interest). DigitalGlobe engineers will need to act within the next few months if the company is to attain and maximize these benefits.

4. Additional/General Considerations:

A. Form 312, Schedule S

As required by the Commission's rules and policies, DigitalGlobe has completed, to the best of its ability and the limitations of the Commission's software, the FCC Form 312, Schedule S submission that reflects the updated orbital characteristics of the QuickBird satellite that are proposed in this Modification Application. As the original application for the QuickBird spacecraft preceded the introduction of Form 312, Schedule S, this is the initial submission of this material for QuickBird.

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[7] *See DigitalGlobe, Inc.*, 20 FCC Rcd. 15696 (¶ 1) (Int'l Bur. 2005) ("*DigitalGlobe Order*") (citing *Amendment of the Commission's Space Station Licensing Rules and Policies*, 18 FCC Rcd 10760 (2003)). The same determination was implicitly made in the DigitalGlobe 2007 Modification Stamp Grant.

[8] To the extent that the Commission may deem it necessary for DigitalGlobe to request the same waiver of the modified processing round requirement of Sections 25.156 and 25.157, 47 C.F.R. §§ 25.156 and 25.157, in order to secure this mode of processing, DigitalGlobe hereby requests such waivers and incorporates by reference its supporting documentation from the 2004 Modification Application in File No. SAT-MOD-20040728-00151. In support of these requests, DigitalGlobe notes that the original public interest considerations – including no harmful interference being caused to other EESS systems currently operating in the band – continue to apply, and there is no inconsistency at all with the public policy goals of the processing procedure. *See* DigitalGlobe 2004 Modification of License Application, File No. SAT-MOD-20040728-00151, at Narrative, Section V; DigitalGlobe 2007 Modification Application at Narrative, Section 2.

[9] *DigitalGlobe Order*, 20 FCC Rcd at 15699 (¶ 8) (citing *Space Imaging, LLC*, 20 FCC Rcd 11964 (Int'l Bur. 2005)).

Now, as has been the case with previous DigitalGlobe modification applications, limitations in the Commission's required software prevent DigitalGlobe from including in the Schedule S certain caveats about the data provided.[10] In order to comply as closely as possible with the Commission's requirement, DigitalGlobe has produced in Attachment A hereto a manually-completed printout of the Schedule S portion of the application that includes technical data intended for inclusion on FCC 312 Schedule S by DigitalGlobe that could not be electronically input into the FCC Schedule S database format.

DigitalGlobe requests that the Commission to resolve the software incompatibility issue outlined in the previous paragraph and Note 10 by relying on data in the Attachment A where there is an inconsistency or incompleteness with or to data in the electronic Schedule S submission that accompanies this Modification Application. DigitalGlobe notes that it a successfully used a similar approach to address the same incompatibility issue in both DigitalGlobe's July 2004 Modification Application and the DigitalGlobe 2007 Modification Application.[11] Any material discrepancies between the data in the electronic version of Schedule S and the version included in the print out in Attachment A hereto should therefore be resolved in favor of the print version in Attachment A.

DigitalGlobe provides additional information regarding the modified orbital characteristics of the QuickBird satellite in Attachment B. This information will allow the Commission to repeat its favorable findings in the *DigitalGlobe Order* regarding sharing with government users systems, meteorological-satellite service uplinks, and other EESS systems, fixed service systems, fixed-satellite service (Earth-to-space).[12] From an interference standpoint, the increased-altitude QuickBird satellite described here is not changed in any material way from the system that the National Telecommunications and Information Administration approved when it considered the original QuickBird applications in the late 1990s and early 2000s.

B. Orbital Debris Mitigation

In the *DigitalGlobe Order*, the Bureau determined that DigitalGlobe's July 2004 Modification Application to add new non-geostationary-orbit satellites to the constellation that already included QuickBird was subject to the default service rule provisions in Section 25.217 of the Commission's Rules, 47 C.F.R. § 25.217.[13] With regard to orbital debris mitigation, the

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[10] Certain data fields in Microsoft Access Database file would not accept DigitalGlobe's data, which, in turn, caused errors in the database. For example, the response to Item S7.h (edge gain for DigitalGlobe's "CMD" beam) should be -16 dBi, as shown in Attachment A. The -10 dBi entry in the electronic version is incorrect, and cannot be manipulated to the correct value. To rectify these situations, DigitalGlobe was forced to input generic information into the electronic database file in order to maintain the integrity of the system. The charts in Attachment A contain all of the sections from Schedule S with the correct data that DigitalGlobe was not fully able to provide in the electronic Schedule S.

[11] *See* DigitalGlobe 2004 Modification of License Application, File No. SAT-MOD-20040728-00151, at Narrative, Attachment A; DigitalGlobe 2007 Modification Application, at Narrative.

[12] *See DigitalGlobe Order,* 20 FCC Rcd at 15703-04 & n. 58 (¶¶ 21-25).

[13] *See DigitalGlobe Order*, 20 FCC Rcd at 15701.

Bureau noted that Section 25.217(d) contains standards for end-of-life spacecraft disposal, designed to mitigate orbital debris.[14] DigitalGlobe had requested a waiver of this regulation in its July 2004 filing.[15]

In assessing DigitalGlobe's July 2004 Modification Application, which proposed three additional non-geostationary orbit EESS satellites (one of which was to operate in an orbit in the same range as QuickBird), the Bureau concluded that "DigitalGlobe has demonstrated good cause for a waiver of the Commission's orbital debris disclosure requirements."[16] The Bureau noted that:

> [i]n adopting the orbital debris disclosure requirements, the Commission specifically found that there was no additional benefit to reviewing the post-mission disposal plans of commercial remote sensing satellite applicants when such plans are already subject to effective regulatory review by NOAA. Thus, the Commission concluded that, to the extent that a remote sensing satellite applicant has submitted its post-mission disposal plans to NOAA for review and approval, the Commission would not require submission of such information. The Commission further stated, however, that with respect to elements of debris mitigation other than post-mission disposal for which NOAA has not received information necessary for review and approval, it would require remote sensing satellite applicants to submit such information as part of an application for a Commission license, and would review any such aspects of a remote sensing applicant's debris mitigation plans that are outside the scope of NOAA review. [17]

The Bureau went on to recognize that DigitalGlobe had already submitted a post-mission disposal plan for the new satellites to NOAA as part of NOAA's licensing process. It thereby concluded that:

> Thus, DigitalGlobe is not required to provide a full disclosure plan to the Commission. Moreover, based on our review of the supplemental Orbital Debris Mitigation Statement provided in DigitalGlobe's

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[14] *Id.* Section 25.217(d) requires applicants, *inter alia*, to submit a narrative statement describing the debris mitigation design and operational strategies that they will use. 47 C.F.R. § 25.217(d).

[15] *See* DigitalGlobe 2004 Modification Application, File No. SAT-MOD-20040728-00151, at Narrative, Section IV.D.

[16] *DigitalGlobe Order*, 20 FCC Rcd at 15705.

[17] *Id. (footnotes omitted) (citing Mitigation of Orbital Debris*, 19 FCC Rcd 11567, 11609 (¶¶ 102-104).

> application, we find that DigitalGlobe need not further supplement its NOAA post-mission disclosure plans at this time.[18]

When DigitalGlobe modified its system in 2007 to add a third satellite and modify orbital parameters for its authorized but as of then unlaunched second satellite, DigitalGlobe made the same demonstration about the orbital debris mitigation plan for the new satellites.[19] DigitalGlobe requested a waiver of Section 25.217(d) of the Commission's Rules and provided information of a type the Commission had previously determined in connection with the 2004 DigitalGlobe Modification to be sufficiently detailed to satisfy the provisions of Section 25.114(d)(14).[20] The Commission took no issue with these showings and made no special provision for orbital debris mitigation in its 2007 Stamp Grant.

DigitalGlobe urges the Commission to treat the orbital debris mitigation element of the QuickBird orbit change proposed here in the same way it handled the orbital debris aspects of the addition of the WorldView satellites pursuant to the 2004 and 2007 modification applications. In other words, the Commission should either determine that the post-mission disposal arrangements through the NOAA process, as supplemented with demonstrations below, are sufficient to satisfy the combined requirements of Sections 25.114(d)(14) and 25.217(d), or it should determine that a waiver of the application information submission requirements of these two regulations is appropriate.

In additional support of this request, DigitalGlobe offers the following showings on the orbital debris mitigation elements in Section 25.114(d)(14) of the Commission's Rules:[21]

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[18] *Id.* (¶ 28). The orbital debris mitigation showing in DigitalGlobe's July 2004 Modification Application included information on the elements of debris mitigation other than post-mission disposal. DigitalGlobe provided statements about the assessment and limitation of the amount of debris released in a planned manner during normal operations (including the probability that an operating spacecraft in the DigitalGlobe remote sensing NGSO system will become a source of debris through collisions with man-made objects or meteors); details of the steps DigitalGlobe has taken to assess and limit the probability of accidental explosions during and after completion of mission operations; and an estimation that the system design and spacecraft mission profiles of the WorldView 60 and 110 satellites will limit the probability of collision with known large objects during the constellation's orbital lifetime. *See* DigitalGlobe 2004 Modification Application, File No. SAT-MOD-20040728-00151, at Narrative, Section IV.D.

[19] DigitalGlobe 2007 Modification Application, at Narrative.

[20] DigitalGlobe recognizes that when the Bureau granted its 2004 Modification Application in the *DigitalGlobe Order*, the orbital debris mitigation requirements of Section 25.114(d)(14) of the Commission's Rules, 47 C.F.R. § 25.114(d)(14), had not yet become effective. This rule, which like Section 25.217(d) calls for the submission of a description of the design and operational strategies that will be used to mitigate orbital debris, requests more specific information than is called for in Section 25.217(d). The Commission's Second Report and Order in *Mitigation of Orbital Debris* noted that for elements of debris mitigation other than post-mission disposal that are covered by the Commission's new rules, the Commission would still require its submission as part of the Commission's space station licensing process, but only if the information was not necessary for review and approval by NOAA. *Mitigation of Orbital Debris*, 19 FCC Rcd at 11609 (¶ 104).

[21] DigitalGlobe notes that the Bureau determined in the *DigitalGlobe Order* that the orbital debris mitigation submission in the 2004 Modification Application was sufficiently detailed to satisfy the provisions of Section 25.114(d)(14). Accordingly, the Commission concluded in the *DigitalGlobe Order* that DigitalGlobe did not need to further supplement its NOAA post-mission disclosure plans. The showing here on the elements of the orbital

1. Spacecraft Hardware Design

DigitalGlobe confirms that the QuickBird satellite will not undergo any planned release of debris during its remaining period of operation. When the QuickBird satellite was contracted for and constructed in the late 1990s, DigitalGlobe's predecessor in interest, in conjunction with the spacecraft manufacturer, assessed and limited the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. DigitalGlobe took steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems. The QuickBird satellite is extremely rugged with regard to meteoroids smaller than 1 cm, by virtue of its redundancy, shielding, separation of components and physical characteristics. This ruggedness is confirmed by the nearly ten years of continuous operation in low-Earth orbit. The satellite is designed to have no single points of failure.

2. Minimizing Accidental Explosions

In conjunction with the satellite's manufacturer, DigitalGlobe has assessed and limited the probability of accidental explosions during and after completion of mission operations. The assessment was based on possible failure modes that could result in explosions, and operational procedures were adopted to limit the probability they will occur. In particular, 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 sources of stored energy onboard the DigitalGlobe spacecraft will have been depleted or when no longer required for mission operations or post-mission disposal.

3. Safe Flight Profiles

DigitalGlobe has estimated that its system design and spacecraft mission profiles will limit the probability of collision with known large objects during the constellation's orbital lifetime. This was the case with the currently-authorized orbit, and remains the case with the proposed slightly higher orbit. Digital Globe's disclosure of the parameters (including the inclination of orbital planes, orbital period, apogee, perigee the argument of perigee, and right ascension of the ascending nodes) used by the QuickBird satellite may assist third parties in identifying potential problems that may be the result of proposed operations, and lends itself to coordination between DigitalGlobe and other operators located in similar orbits.

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debris mitigation requirements in Section 25.114(d)(14) other than post-mission disposal are at least as detailed and informative as the showings in DigitalGlobe's 2004 Modification Application and 2007 Modification Application.

4. Post-Mission Disposal

As part of DigitalGlobe's authorization to operate a remote sensing satellite system under the Land Remote Sensing Policy Act, 15 U.S.C. §5601 *et seq.*, DigitalGlobe filed a plan for post-mission disposal of QuickBird with NOAA. DigitalGlobe's orbital debris mitigation and post-mission disposal plans for QuickBird in its current orbit were approved by NOAA.

DigitalGlobe has provided the information pertaining to post-mission disposal of QuickBird in relation to the new orbit parameters to NOAA, and expects that favorable action by NOAA under the applicable NOAA regulations will be taken by the end of 2010. The key fact is that DigitalGlobe's post-mission disposal plans for QuickBird were initially approved by NOAA prior to commencement of QuickBird operation in the early 2000s. These plans remain fully applicable, and are not impacted in any way by the minor adjustments DigitalGlobe proposes to make to the QuickBird orbital configuration. Importantly, as QuickBird is in orbit, and its materials composition cannot be changed, the key factor here is that the slight orbit increase DigitalGlobe is proposing does not increase the satellite's susceptibility to collisions or fragmentation events or hamper execution of post-mission disposal in any material way.

5. Accuracy with which Orbital Parameters will be Maintained

As a final matter, DigitalGlobe provides the Commission with the information called for in Section 25.114(d)(14)(iii) of the Commission's Rules, and "discloses the accuracy – if any – with which orbital parameters of [its] non-geostationary satellite orbit space stations will be maintained, including apogee, perigee, inclination, and the right ascension of the ascending node(s)." 47 C.F.R. § 25.114(d)(14)(iii). *See* Table 1 below. To the extent that Section 25.114(d)(14)(iii) also calls for indication of the anticipated evolution over time of the satellites' orbits, DigitalGlobe informs the Commission here that the evolution over time of the QuickBird satellite's orbit is anticipated to remain within the ranges given in Table 1 as a result of corrective measures (e.g., satellite thruster/maneuvering burns) to be taken by DigitalGlobe during the satellite's remaining lifetime.

Table 1: Anticipated Ranges of Accuracy to Which QuickBird Orbital Parameters Are Maintained:

	QuickBird Orbital Parameters
Inclination Angle (deg.)	+/- 0.1
Apogee (km)	+/- 1.5
Perigee (km)	+/- 1.5
Right Ascension of the Ascending Node (deg)	+/- 5.84

ATTACHMENT A

ANNOTATED FCC FORM 312, SCHEDULE S

FCC 312
Schedule S

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
(Technical and Operational Description)

Page 1: General, Frequency Bands, and GSO Orbit

S1. GENERAL INFORMATION Complete for all satellite applications.

a. Space Station or Satellite Network Name: USASAT 30A (S2129)	e. Estimated Date of Placement into Service: Quickbird: Jan 2002	i. Will the space station(s) operate on a Common Carrier basis? ☐ YES ☑ NO
b. Construction Commencement Date: Quickbird: July 1997	f. Estimated Lifetime of Satellite(s): 12 Years	j. Number of transponders offered on a Common Carrier basis: 0
c. Construction Completion Date: Quickbird: May 2001	g. Total Number of Transponders: 0	k. Total Common Carrier Transponder Bandwidth: 0 MHz
d. Estimated Launch Date: Quickbird: Dec 2001	h. Total Transponder Bandwidth (No. Transponders x Bandwidth): 0 MHz	l. Orbit Type: Mark all boxes that apply. ☐ GSO ☑ NGSO

S2. OPERATING FREQUENCY BANDS Identify the frequency range and transmit/receive mode for all frequency bands inwhich this station will operate. Also indicate the nature of service(s) for each frequency band.

Frequency Band Limits					
Lower Frequency (_Hz)		Upper Frequency (_Hz)			
a. Numeric	b. Unit (K/M/G)	c. Numeric	d. Unit (K/M/G)	e. T/R Mode	f. Nature of Service(s): List all that apply to this band
8025	M	8345	M	T	Earth exploration satellite service

S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:

a. Nominal Orbital Longitude (Degrees E/W):

b. Reason for orbital location selection:

Longitudinal Tolerance or E/W Station-Keeping:
c. Toward West: _____ Degrees
d. Toward East: _____ Degrees

e. Inclination Excursion or N/S Station-Keeping Tolerance: _____ Degrees

Range of orbital arc in which adequate service can be provided (Optional): Degrees E/W
f. Westernmost: _____ ___
g. Easternmost: _____ ___

h. Reason for service arc selection (Optional):

FEDERAL COMMUNICATIONS COMMISSION **Page 2: NGSO Orbits**
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S4. ORBITAL INFORMATION FOR NON-GEOSTATIONARY SATELLITES ONLY

S4a. Total Number of Satellites in Network or System: 1

S4b. Total Number of Orbital Planes in Network or System: 1

S4c. Celestial Reference Body (Earth, Sun, Moon, etc.): Earth

S4d. Orbit Epoch Date: 1 Oct 2010; 12:00:00 UTCG

For each Orbital Plane Provide:

(e) Orbital Plane No.	(f) No. of Satellites in Plane	(g) Inclination Angle (degrees)	(h) Orbital Period (Seconds)	(i) Apogee (km)	(j) Perigee (km)	(k) Right Ascension of the Ascending Node (Deg.)	(l) Argument of Perigee (Degrees)	Active Service Arc Range (Degrees)		
								(m) Begin Angle	(n) End Angle	(o) Other
3 (QB)	1	97.39	5664	498	481	344.8	90	0	360	

S5. INITIAL SATELLITE PHASE ANGLE For each satellite in each orbital plane, provide the initial phase angle.

(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)	(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)	(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)	(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)
3 (QB)	1	0									

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SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S6. SERVICE AREA CHARACTERISTICS For each service area provide:

(a) Service Area ID	(b) Type of Associated Station (Earth or Space)	(c) Service Area Diagram File Name (GXT File)	(d) Service Area Description. Provide list of geographic areas (state postal codes or ITU 3-ltr codes), satellites or Figure No. of Service Area Diagram.

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S7. SPACE STATION ANTENNA BEAM CHARACTERISTICS For each antenna beam provide:

(a) Beam ID	(b) T/R Mode	Isotropic Antenna Gain		(e) Pointing Error (Degrees)	(f) Rotational Error (Degrees)	(g) Min. Cross-Polar Isolation (dB)	(h) Polarization Switchable? (Y/N)	(i) Polarization Alignment Rel. Equatorial Plane (Degrees)	(j) Service Area ID	Transmit			Receive			Input Attenuator (dB)	
		(c) Peak (dBi)	(d) Edge (dBi)							(k) Input Losses (dB)	(l) Effective Output Power (W)	(m) Max. EIRP (dBW)	(n) System Noice Temperature (K)	(o) G/T at Max.Gain Pt. (dB/K)	(p) Min. Saturation Flux Density (dBW/m2)	(q) Max. Value	(r) Step Size
ST3	T	6	-14	0	0 *	15	N			8.1	0.8	4.9					
ST4	T	24.7	23.7	1	0 **	15	N			3.55	2.65	29.0					
CMD	R	3	-16.0	0*	0*		N						795	-26.0	-94.9***		

Notes: * Antenna is spacecraft body-mounted, and not pointed at earth station
** Beam is circularly symmetric. *** Command receiver is not a transponder.

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FCC Form 312 - Schedule S: (Technical and Operational Description)

Page 5: Beam Diagrams

S8. ANTENNA BEAM DIAGRAMS For each beam pattern provide the reference to the graphic image and numerical data:
Also provide the power flux density levels in each beam that result from the emission with the highest power flux density.

(a) Beam ID	(b) T/R Mode	(c) Co- or Cross-Polar Mode ("C" or "X")	(d) GSO Ref. Orbital Longitude (Deg. E/W)	(e) NGSO Antenna Gain Contour Description (Figure / Table / Exhibit)	(f) GSO Antenna Gain Contour Data (GXT File)	Max. Power Flux Density (dBW/m2 per Reference Bandwidth*) At Angle of Arrival above horizontal (for emission with highest PFD)					(l) Reference Bandwidth* (4kHz or 1MHz)
						(g) 5 Deg	(h) 10 Deg	(i) 15 Deg	(j) 20 Deg	(k) 25 Deg	

*Use a Reference Bandwidth of 4 kHz or 1 MHz as appropriate to the FCC Rules that apply to the subject frequency band (§ 25.208).

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Page 6: Channels and Transponders

S9. SPACE STATION CHANNELS For each frequency channel provide:

(a) Channel No.	(b) Assigned Bandwidth (kHz)	(c) T/R Mode	(d) Center Frequency (MHz)	(e) Polarization (H,V,L,R)	(f) TT&C or Comm Channel (T or C)
ST3	4000	T	8030.0	R	C
ST4	320000	T	8185.0	R	C
CMD	250	R	2085.6875	R	T

S10. SPACE STATION TRANSPONDERS** For each transponder provide:

(a) Transponder ID	(b) Transponder Gain* (dB)	Receive Band		Transmit Band	
		(c) Channel No.	(d) Beam ID	(e) Channel No.	(f) Beam ID

*Transponder gain between output of receiving antenna and input of transmitting antenna.
**Also complete this table for half-links such as TT&C and on-board processing. In such cases, provide the receive or transmit information, as appropriate.

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S11. DIGITAL MODULATION PARAMETERS For each digital emission provide:

(a) Digital Mod. ID	(b) Emission Designator	(c) Assigned Bandwidth (kHz)	(d) No. of Phases	(e) Uncoded Data Rate (kbps)	(f) FEC Error Correction Coding Rate	(g) CDMA Processing Gain (dB)	(h) Total C/N Performance Objective (dB)	(i) Single Entry C/I Objective (dB)
ST3	4M00G7D	4000	1	262	0.5	0	22.05	27.0
ST4	320MG7D	320000	2	256000	0.80	0	20.7	27.0
CMD	250KXFD	250	1	2	1	0		(receive)

Rev 4d, June 19, 2003, 5:45 pm

S12. ANALOG MODULATION PARAMETERS For each analog emission provide: NONE

(a) Analog Mod. ID	(b) Emission Designator	(c) Assigned Bandwidth (kHz)	(d) Signal Type* (see below)	(e) Channels per Carrier	Multi-channel Telephony (f) Ave. Companded Talker Level (dBm0)	Multi-channel Telephony (g) Bottom Baseband Freq. (MHz)	Multi-channel Telephony (h) Top Baseband Freq. (MHz)	Multi-channel Telephony (i) RMS Modulation Index	(j) Video Standard NTSC, PAL, etc.	(k) Video Noise Weight-ing (dB)	(l) Video & SCPC/FM Modulation Index	(m) SCPC/FM Compander, Preemphasis, & Noise Weight-ing (dB)	(n) Total C/N Performance Objective (dB)	(o) Single Entry C/I Objective (dB)

*Indicate whether signal is (a) FDM/FM, (b) CSSB/AM, (c) SCPC/FM, or (d) TV/FM.

S13. TYPICAL EMISSIONS For each planned type of emission provide:

Associated Transponder ID Range		Modulation ID		(e) Carriers per Transponder	(f) Carrier Spacing (kHz)	(g) Noise Budget Reference (Table No.)	(h) Energy Dispersal Bandwidth* (kHz)	Receive Band (Assoc.Transmit Stn)			Transmit Band (This Space Station)				
								(i)Assoc.Stn Max.Antenna Gain (dBi)	Assoc. Station Transmit Power (dBW)		EIRP (dBW)		Max. Power Flux Density		(p) Assoc. Stn Rec. G/T (dB/K)
(a) Start	(b) End	(c) Digital (Table S11)	(d) Analog (Table S12)						(j) Min.	(k) Max.	(l) Min.	(m) Max.	(n)dBW/m2	(o)Ref. BW** (4kHz or 1MHz)	

* For those emissions using energy dispersal, provide the bandwidth of the energy dispersal. Otherwise, leave blank.
**Use a Reference Bandwidth of 4 kHz or 1 MHz as appropriate to the FCC Rules that apply to the subject frequency band (§ 25.208).

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S14. Is the space station(s) controlled and monitored remotely? If YES, provide the location and telephone number of the TT&C control point(s). ☐ YES ☐ NO

Remote Control (TT&C) Location(s):

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number	S14g. Call Sign of Control Station (if appropriate)		

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number	S14g. Call Sign of Control Station (if appropriate)		

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number	S14g. Call Sign of Control Station (if appropriate)		

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number	S14g. Call Sign of Control Station (if appropriate)		

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number	S14g. Call Sign of Control Station (if appropriate)		

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number	S14g. Call Sign of Control Station (if appropriate)		

S15. SPACECRAFT PHYSICAL CHARACTERISTICS QB-2

S15a. Mass of spacecraft without fuel (kg) 952.5	Spacecraft Dimensions (meters)	Probability of Survival to End of Life (0.0 - 1.0)
S15b. Mass of fuel & disposables at launch (kg) 76.0		
S15c. Mass of spacecraft and fuel at launch (kg) 1028.5	S15f. Length (m) 1.6	S15i. Payload 0.7981
S15d. Mass of fuel, in orbit, at beginning of life (kg) 76.0	S15g. Width (m) 1.5	S15j. Bus 0.9397
S15e. Deployed Area of Solar Array (square meters) 7.7	S15h. Height (m) 2.9	S15k. Total 0.7500

S16. SPACECRAFT ELECTRICAL CHARACTERISTICS

Spacecraft Subsystem	Electrical Power (Watts) At Beginning of Life		Electrical Power (Watts) At End of Life	
	At Equinox	At Solstice	At Equinox	At Solstice
Payload (Watts)	(a) 79	(f) 79	(k) 79	(p) 79
Bus (Watts)	(b) 488	(g) 488	(l) 488	(q) 488
Total (Watts)	(c) 567	(h) 567	(m) 567	(r) 567
Solar Array (Watts)	(d) 721	(i) 721	(n) 721	(s) 721
Depth of Battery Discharge (%)	(e) 15 %	(j) 15 %	(o) 15 %	(t) 15 %

S17. CERTIFICATIONS

a. Are the power flux density limits of § 25.208 met?	☐ YES	☐ NO	☑ N/A
b. Are the appropriate service area coverage requirements of § 25.143(b)(ii) and (iii), or § 25.145(c)(1) and (2) met?	☐ YES	☐ NO	☑ N/A
c. Are the frequency tolerances of § 25.202(e) and the out-of-band emission limits of § 25.202(f)(1), (2), and (3) met?	☑ YES	☐ NO	☐ N/A

In addition to the information required in this Form, the space station applicant is required to provide all the information specified in Section 25.114 of the Commission's rules, 47 C.F.R. § 25.114.

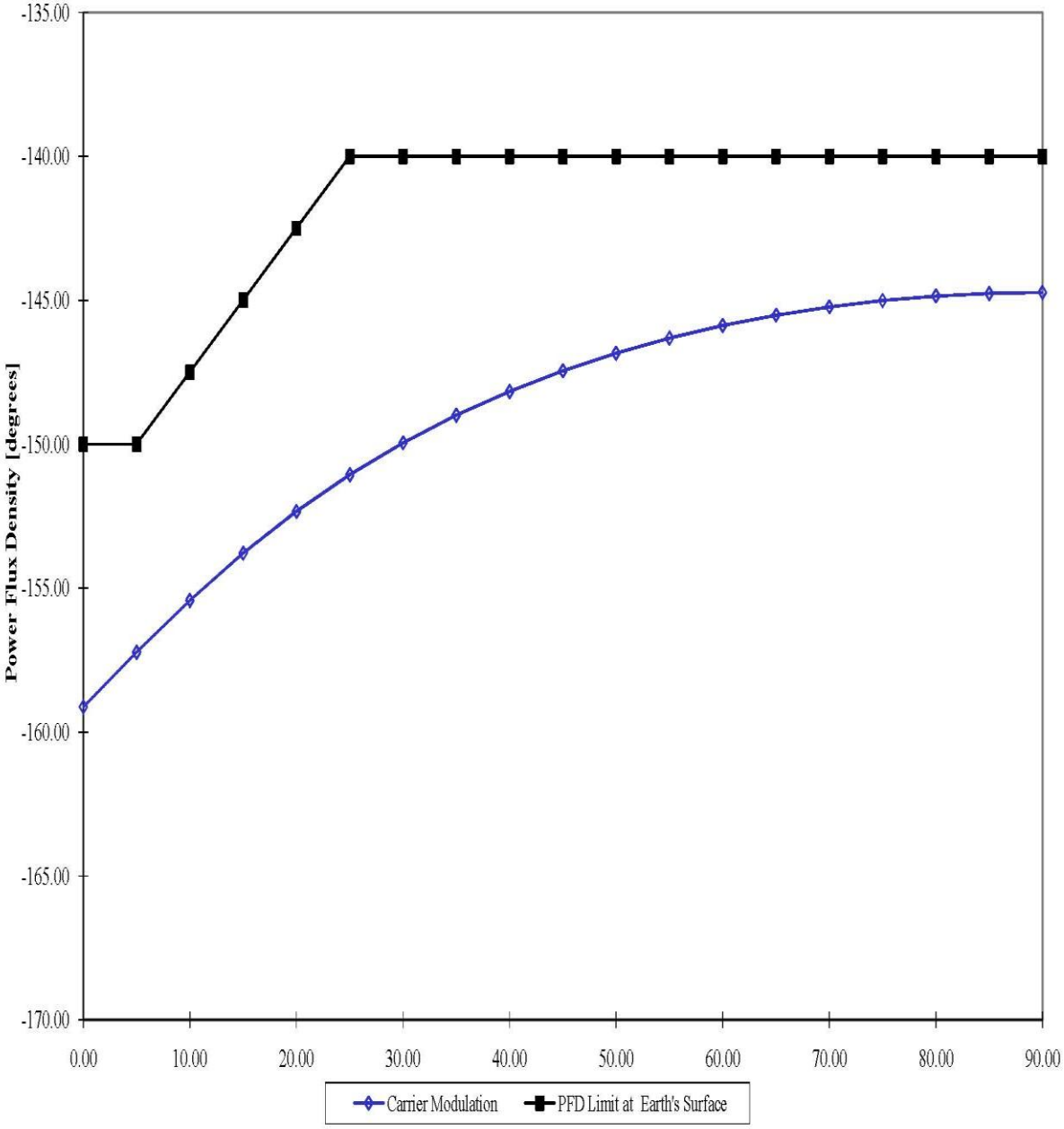
ATTACHMENT B

Summary Information Related to DigitalGlobe Non-GSO EESS Remote Sensing Satellite System

Mission Data Downlink Analysis

320 MHz DATA RATE DOWNLINK ANALYSIS		
Fo = 8.185 GHz		
DOWNLINK PARAMETERS:		
Frequency	8.185	GHz
Orbit height in km	481	km
Local elevation above hor.	5	degrees
Data rate	320	Mbps
Bandwidth	160	MHz
Spacecraft ant. EIRP at max scan	59.0	dBm
Slant range	2027.92	km
Ground ant. G/T	30.8	dB/K
BER	1.00E-09	
Required Eb/No (without coding)	12.7	dB
Hardware imp. BER loss	-2.0	dB
LINK CALCULATION:		
TOTAL POWER TO GROUND:		
Satellite EIRP	59.0	dBm
Path loss	-176.8	dB
Total loss (rain, polarization, etc.)	-2.2	dB
RECEIVER SENSITIVITY:		
Required Eb/No	12.7	dB
Available Eb/No	23.3	dB
DOWNLINK MARGIN	**8.6**	**dB**
ANTENNA SIZES:		
Spacecraft Antenna Segment		
Spacecraft dish diameter	9.8	inches
Approx. HPBW	10.4	degrees
Gain of spacecraft antenna	24.7	dBic
Loss between HPA out and ant. output	-3.6	dB
Transmitter Po	6.0	watts
EIRP of satellite system	59.0	dBm
Ground Antenna Segment		
Ground antenna G/T	30.8	dB/K
System noise temperature	188.2	K (referenced at aperture)
Directivity gain ground antenna	54.0	dBic
Ground dish diameter	7.3	meters
Approx. HPBW	0.4	degrees

QuickBird Wideband Power Flux Density as a function of Ground Elevation Angle



Narrowband Downlink Link Analysis

TELEMETRY DOWNLINK R/T, PBK /NADIR

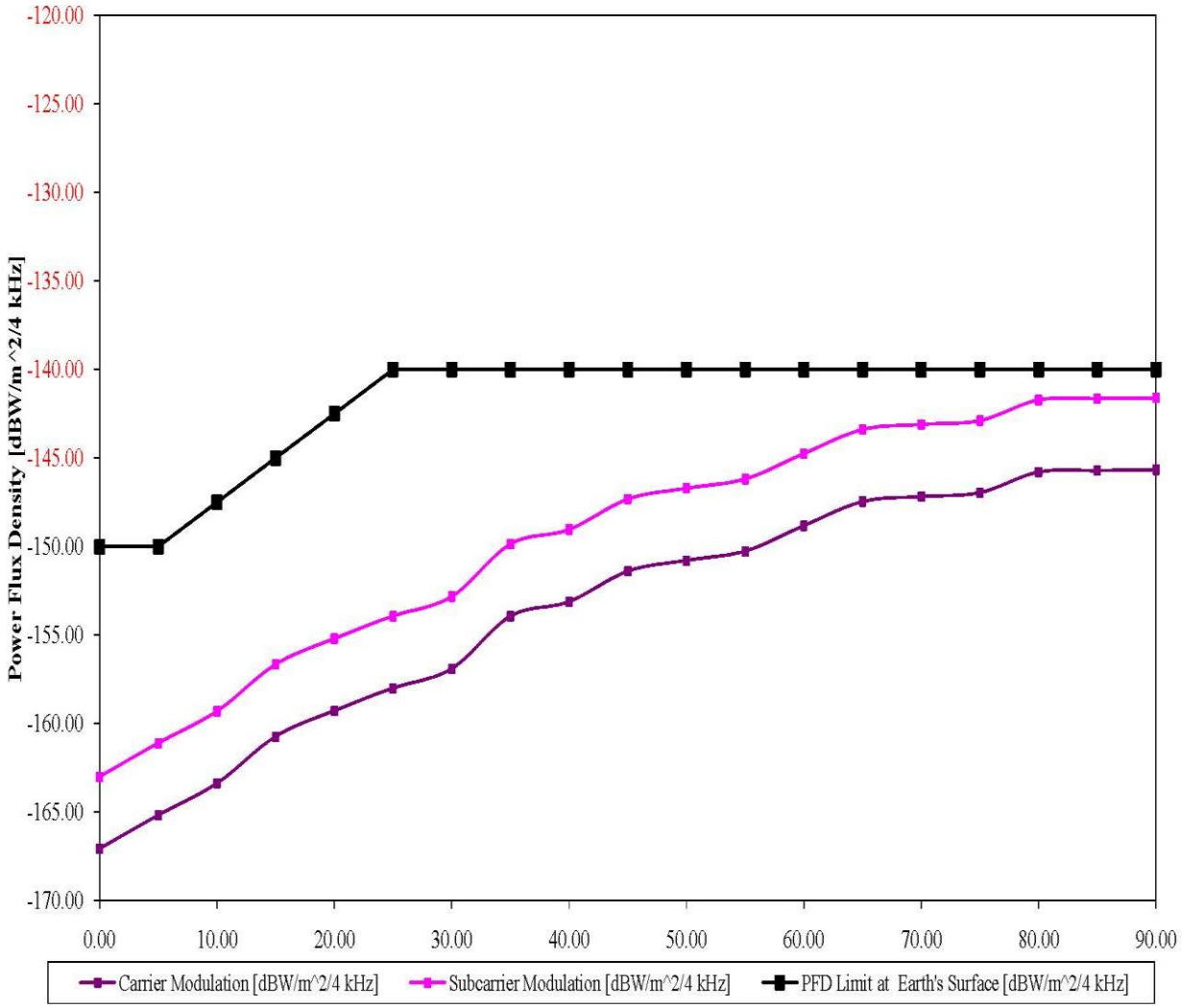
EarthWatch

FREQUENCY	8.03 GHz		
POWER	5 WATTS	WAVELENGTH	0.04 METERS
ALTITUDE	481.0 KM	5 DEG SLANT RANGE	2027.9 KM
REAL TIME DATA ON 1.7, PCM/PSK/PM		**DATA RATE**	16.384 KBPS
PLAY BACK DATA PCM/PM		**DATA RATE**	262.144 KBPS
		MARGIN dB	
R/T MOD INDEX	1.1	CARRIER	29.4
PBK MOD INDEX	1.2	R/T	19.5
		PBK	15.6

ANTENNA: NADIR

	PARAMETER	UNITS	VALUE
1	TOTAL TRANSMIT POWER	dBm	37.0
2	PASSIVE LOSS	dB	-8.1
3	S/C ANTENNA GAIN >+/- 90 DEG	dBic	0.0
4	FREE SPACE DISPERSION LOSS	dB	-176.7
5	ATMOSPHERIC LOSS	dB	-1.5
6	GROUND STATION G/T (spec)	dB/K	31.5
7	TOTAL RECEIVED POWER/T	dBm/K	-117.8
8	BOLTZMANN CONSTANT	dBm/Hz-K	-198.6
9	TOTAL RECEIVED POWER/KT	dB-Hz	80.8
	CARRIER CHANNEL		
10	CARRIER/TOTAL POWER	dB	-11.7
11	CARRIER POWER/KT (min)	dB-Hz	69.2
12	CARRIER LOOP BW (300 Hz)	dB-Hz	24.8
13	CARRIER/NOISE	dB	44.4
14	REQUIRED CARRIER/NOISE	dB	15.0
15	CARRIER MARGIN	dB	29.4
	DATA CHANNEL (PCM/PM) (playback)		
16	DATA/TOTAL POWER (MI=1.2)	dB	-4.4
17	DATA POWER/KT	dB-Hz	76.5
18	INFORMATION RATE 262 KBPS	dB-Hz	54.2
19	AVAILABLE S/N	dB	22.3
20	REQUIRED Eb/No 10E-5 BER	dB	11.9
21	CODING GAIN	dB	5.2
22	AVAILABLE SIGNAL MARGIN	dB	15.6
	DATA CHANNEL (PCM/PSK/PM) (real time)		
23	DATA/TOTAL POWER (MI=1.1)	dB	-12.3
24	DATA POWER/KT	dB-Hz	68.5
25	INFORMATION RATE 16 KBPS	dB-Hz	42.1
26	AVAILABLE S/N	dB	26.3
27	REQUIRED Eb/No 10E-5 BER	dB	12.0
28	CODING GAIN	dB	5.2
29	AVAILABLE SIGNAL MARGIN	dB	19.5

QuickBird Narrowband Power Flux Density as a function of Ground Elevation Angle with QB Patch Antenna



S-band Command Uplink Link Analysis

COMMAND UPLINK OMNI ANTENNA NOMINAL

EarthWatch

FREQUENCY	2.0856875	GHz			
UPLINK	45.0	dBW EIRP	WAVELENGTH	0.14	METERS
ALTITUDE	481.0	KM	5 DEG SLANT RANGE	2027.9	KM
COMMAND DATA ON TONES			**DATA RATE**		**KBPS**
CMD MOD INDEX	1.0		MARGIN dB		
			CARRIER	8.0	
			CMD	3.0	

ANTENNA: OMNI NOMINAL +/- 75 DEG

PARAMETER	UNIT	VALUE
UPLINK EIRP	dBW	45.0
FREE SPACE DISPERSION LOSS	dB	-165.0
POINTING LOSS	dB	-0.5
ATMOSPHERIC LOSS 42 mm/hr	dB	-0.4
S/C ANTENNA GAIN < +/- 75 DEG	dBi	-16.0
POLARIZATION LOSS	dB	-3.0
S/C LINE LOSS	dB	-1.1
TOTAL S/C RECEIVED POWER	dBm	-111.0
CARRIER PERFORMANCE		
NET RECEIVED POWER	dBm	-111.0
MIN CARRIER ACQUIS POWER	dBm	-119.0
MARGIN CARRIER ACQUISITION	dB	8.0
COMMAND CHANNEL PERFORMANCE (MI=1.0)		
NET RECEIVED POWER	dBm	-111.0
MINIMUMCMD CHANNEL POWER	dBm	-114.0
COMMAND DESIGN MARGIN	dB	3.0

TECHNICAL CERTIFICATE

I, Michael Martinez, hereby certify, under penalty of perjury, that I am the technically qualified person responsible for the preparation of the engineering information contained in the technical portions of the foregoing amendment and the related attachments, that I am familiar with Part 25 of the Commission's Rules, and that the technical information is complete and accurate to the best of my knowledge and belief.

Michael Martinez

Michael Martinez
Director of Space Operations
DigitalGlobe, Inc.

Dated: November 19, 2010