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

Application of	)	
DIRECTV ENTERPRISES, LLC	)	File No. SAT-AMD-20080114-____
To Amend its Application for Authorization to Launch and Operate DIRECTV RB-1, a Satellite in the 17/24 GHz Broadcasting Satellite Service at 99° W.L.	)	Call Sign: S2711

AMENDMENT TO APPLICATION FOR AUTHORIZATION TO LAUNCH AND OPERATE DIRECTV RB-1, A SATELLITE IN THE 17/24 GHz BROADCASTING SATELLITE SERVICE

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AMENDMENT TO APPLICATION FOR AUTHORIZATION TO LAUNCH AND OPERATE DIRECTV RB-1, A SATELLITE IN THE 17/24 GHz BROADCASTING SATELLITE SERVICE

DIRECTV Enterprises, LLC ("DIRECTV") hereby amends it pending request for authority to launch and operate a satellite to be known as DIRECTV RB-1 in the 17/24 GHz Broadcasting Satellite Service ("17/24 GHz BSS") at the nominal 99° W.L. orbital location.[1] DIRECTV currently operates a direct-to-home ("DTH") satellite system consisting of six high-power Direct Broadcast Satellite ("DBS") space stations at the nominal 101° W.L., 110° W.L., 119° W.L. and 72.5° W.L. orbital locations and three Ka-band satellites at the nominal 99° W.L. and 103° W.L orbital locations.[2] DIRECTV uses these satellites to retransmit digital video and audio entertainment, educational and

[1] *See* FCC File No. SAT-LOA-20060908-00099. Although the satellite was designated "DIRECTV BSS-99W" in original application, DIRECTV is re-designating all of its proposed 17/24 GHz BSS satellites to give them a uniform system of nomenclature.

[2] Note that DIRECTV actually operates five Ka-band satellites, but two of those are hybrid DBS/Ka-band satellites at 101º W.L. (*i.e.*, DIRECTV 8 and DIRECTV 9S), and the Ka-band payloads on these satellites are used for backhauling local signals to DIRECTV broadcast centers, and not directly for DTH.

informational programming to more than 16 million subscribers throughout the United States who receive this programming using small dish antennas.

As set forth below, the addition of capacity from this 17/24 GHz BSS satellite to DIRECTV's existing fleet will enhance DIRECTV's ability to provide compelling and cutting-edge video services to its subscribers and to continue to offer U.S. consumers a powerful multichannel video programming distribution ("MVPD") alternative to services offered by much larger rivals.

I. GRANT OF THIS APPLICATION WOULD SERVE THE PUBLIC INTEREST

Over a decade ago, DIRECTV became the first to offer consumers nationwide an all-digital, satellite-based video service, and it has maintained its position as a market leader ever since. Throughout this period, DIRECTV has constantly striven to use advanced technology – from spot beam satellites to improved compression and modulation techniques – to offer consumers an ever more innovative slate of products and services. Continuing this tradition of excellence and innovation, DIRECTV proposes in this application to make use of the BSS spectrum in the 17/24 GHz band.

DIRECTV was the first to propose such service. In 1992, the International Telecommunication Union ("ITU") allocated the 17.3-17.8 GHz downlink band – which is currently used for DBS feeder uplinks – to the BSS on a primary basis in Region 2, effective April 1, 2007. In June 1997, DIRECTV filed an application for three 17/24 GHz BSS slots (96.5° W.L., 101° W.L., and 105.5° W.L.) to complement its DBS operations.[3] At the same time, DIRECTV also filed a petition for rulemaking to conform the U.S. table of allocations to the international BSS allocations, such that the 17.3-17.8 GHz band would be available for BSS downlinks and the 24.75-25.25 GHz band would

[3] *See* FCC File Nos. SAT-LOA-19970605-00049, -00050, and -00051.

be available for BSS feeder links.[4] The Commission initiated such a rulemaking in 1998, and implemented (in large part) the ITU spectrum allocations in 2000.[5] Specifically, effective April 1, 2007, the Commission allocated (1) the 17.3-17.7 GHz band on a primary basis to the BSS for downlink transmissions; (2) the 24.75-25.05 GHz band on a primary basis for BSS feeder uplinks; and (3) the 25.05-25.25 GHz band for co-primary use between BSS feeder uplinks and the 24 GHz Fixed Service.

More recently, the Commission adopted licensing and service rules for the 17/24 GHz BSS service.[6] Among many other things, these rules establish presumptive orbital spacing for 17/24 GHz BSS systems and operational parameters for space stations using these slots, and directed existing applicants to amend their applications to conform to the new service rules.[7] This application either satisfies all relevant requirements of the Commission's rules or demonstrates why compliance is not practicable at this time.

DIRECTV and its affiliates have invested years of effort and several billion dollars in developing and implementing the nation's leading DTH satellite system. It is legally, technically, and otherwise qualified to construct, launch and operate the

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4 *See Public Notice*, Report No. 2208 (rel. July 1, 1997).

5 *See Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite Service Use*, 15 FCC Rcd. 13430, ¶¶ 95-106 (2000).

6 *See Establishment of Policies and Service Rules for the Broadcasting Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, 22 FCC Rcd. 8842 (2007) ("*BSS R&O*").

7 In an order on *sua sponte* reconsideration, the Commission provided 17/24 GHz BSS systems additional flexibility to operate at orbital locations other than those presumptively specified by the Commission under certain conditions. *See Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band*, 22 FCC Rcd. 17951 (2007) ("*Sua Sponte Recon*").

requested satellite system. The 17/24 GHz BSS system proposed in this application will help to ensure that DIRECTV RB-1 will operate efficiently and effectively and will be able to provide services that will enhance DIRECTV's overall consumer offerings. The addition of this satellite will continue the evolution of DIRECTV's network architecture, augmenting its capabilities and thereby enhancing its ability to respond to the rapidly changing needs of its customers in the satellite services markets.

For the foregoing reasons, DIRECTV requests that the Commission grant this application as expeditiously as possible.

II. INFORMATION REQUIRED UNDER SEC. 25.114 OF THE COMMISSION'S RULES

1. Name, Address, and Telephone Number of Applicant

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3. Type of Authorization Requested

DIRECTV hereby applies for authority to launch and operate a new 17/24 GHz BSS satellite, DIRECTV RB-1, and locate it at a position slightly offset from the nominal 99° W.L. orbital location. DIRECTV RB-1, a state-of-the-art satellite that will provide BSS service in the 17 GHz BSS band, will augment DIRECTV's capabilities to provide competitive MVPD services to subscribers across the United States (including Alaska and Hawaii).

DIRECTV recognizes that the orbital location it seeks is slightly offset from the presumptive "on-grid" slot at 99° W.L. established in Appendix F of the *BSS R&O*[8] (an "Appendix F slot"). Accordingly, it seeks authority to operate at reduced power and without full interference protection, as contemplated in Sections 25.114(d)(15)(iii) and 25.262(b) of the Commission's rules.[9]

4. General Description of Overall System Facilities, Operations and Services

DIRECTV RB-1 will consist of a geostationary satellite located at the nominal 99° W.L. orbital location and associated ground station equipment. DIRECTV RB-1 is a high-power satellite designed to provide DTH service in the ITU Region 2 BSS band and its associated feeder link band (*i.e.,* 17.3-17.7 GHz (space-to-Earth) and 24.75-25.15 GHz (Earth-to-space)).

The DTH service will be provided to millions of customers in the United States using relatively small receive antennas. The Telemetry, Tracking and Control ("TT&C") functions will be provided at the lower edge of the 17.3-17.7 GHz (space-to-Earth) band and at the lower edge of the 24.75-25.15 GHz (Earth-to-space) band.

DIRECTV RB-1 will broadcast on up to eighteen frequencies supporting U.S. national beam transmissions. U.S. national beam coverage will encompass the contiguous 48 states (CONUS) plus Alaska and Hawaii. All eighteen channels will have a usable bandwidth of 36 MHz. and the satellite transmit spectrum used will be restricted to 17.3-17.7 GHz.

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8 *See BSS R&O*, Appendix F.

9 *See* 47 C.F.R. §§ 25.114(d)(15)(iii) and 25.262(b). The Commission revised the rules so that an operator offset by up to one degree from an Appendix F slot would not have to reduce power or accept additional interference if there were no other applicant or licensee at the adjacent Appendix F slot. *See Sua Sponte Recon*, ¶ 22. In this case, however, DIRECTV has applied for the adjacent slot as well, so the revised rule is not applicable.

5. Operational Characteristics

5.1 Frequency/Channelization and Polarization Plan

Details of the DIRECTV RB-1 frequency/channelization and polarization plan, including the TT&C frequencies, are included in the accompanying Schedule S, which is hereby incorporated by reference as if fully set forth herein. All uplink channels will be fed to DIRECTV RB-1 from two distinct sites, currently expected to be the DIRECTV uplink facilities in Moxee, WA and Tucson, AZ.[10] The emission designators for the uplink and downlink communications signals will be 36M0G7W and the allocated bandwidth for these emissions is 36 MHz.

5.2 Communications Payload

5.2.1 Uplink Transmissions

The maximum receive antenna gain, receive system noise temperature, and maximum G/T of the DIRECTV RB-1 satellite are all specified in the accompanying Schedule S. Note that the G/T will decrease, dB-for-dB, from the maximum as the uplink location moves away from beam peak.

DIRECTV RB-1 will employ input multiplexer ("IMUX") filters to limit the bandwidth of received signals. The specified performance for these filters is shown in Table 5-1.

[10] Note that DIRECTV has filed a petition for reconsideration of certain aspects of the *BSS R&O* pertaining to, inter alia, licensing of BSS feederlink earth stations in areas where there are existing 24 GHz Fixed Service licensees. Should the Commission clarify that licensing of BSS feederlink earth stations in such areas is not prohibited, DIRECTV may apply for licenses for additional uplink facilities to be included in the DIRECTV RB-1 network.

Parameter	Frequency (F_c)	Specification
Insertion Loss Variation	±9 MHz	0.15 dB_{p-p}
	±11.6 MHz	0.19 dB_{p-p}
	±14.4 MHz	0.40 dB_{p-p}
	±18.0 MHz	1.14 dB_{p-p}
Out of Band Rejection	±22.8 MHz	3.0 dB
	±35.5 MHz	30.0 dB
	±56.3 MHz	30.0 dB

Table 5-1. Response Characteristic of Representative DIRECTV RB-1 36 MHz IMUX Channel Filter

5.2.2 Downlink Transmissions

The DIRECTV RB-1 downlink will be capable of a maximum EIRP of 63.0 dBW. The peak transmit antenna gain and associated contours are specified in the accompanying Schedule S.

The DIRECTV RB-1 uplink channels will be routed to the appropriate band-limiting input multiplexer comprising the receive channel filters and will be frequency translated to the desired output channel frequency. The filtered and frequency translated signals will be amplified by channel amplifiers with selectable fixed/Automatic Level Control (ALC) modes prior to final amplification. The fixed gain mode will have at least 20 dB of gain adjustment with a step size of 1 dB. The ALC will hold the output level constant over an input dynamic range of at least 15 dB and will have a minimum output level adjustment of 10 dB in 0.5 dB increments.

DIRECTV RB-1 will employ output multiplexer ("OMUX") filters to limit the bandwidth of transmitted signals. The specified performance for these filters is shown in Table 5-2.

Parameter	Frequency (F_c)	Specification
Insertion Loss Variation	±9 MHz	0.10 dB_{p-p}
	±11.6 MHz	0.15 dB_{p-p}
	±14.4 MHz	0.22 dB_{p-p}
	±18.0 MHz	0.38 dB_{p-p}
Out of Band Rejection	±26.3 MHz	3.0 dB
	±33.3 MHz	25.0 dB

Table 5-2. Normalized Representative DIRECTV RB-1 36 MHz OMUX Channel Filter

5.3 TT&C Subsystem

The TT&C subsystem provides redundant telemetry, tracking, and command channels for the spacecraft. The principal functions of the subsystem are:

1. Reception and amplification of the radio frequency command uplinks and demodulation of baseband for subsequent signal processing and command distribution.
2. Modulation, up-conversion, amplification, and transmission of all telemetry data.
3. Reception and retransmission of ground-station-generated ranging signals.

The TT&C subsystem will be designed to accommodate the unique requirements of pre-launch, orbit raising, and on-station synchronous orbit operations. Access at initial spacecraft acquisition and major orbit-raising maneuvers will be via the wide-beam (+Z) and narrow-beam (-Z) omni antennas. Normal on-station commands will be received through the receive communications antenna, while on-station telemetry will be transmitted through the national beam transmit antenna. The TT&C frequency and polarization plans for all phases of the mission are shown in Table 5-3. Note that DIRECTV currently plans to perform all TT&C functions in the 17/24 GHz BSS bands.

	Frequency, MHz	Polarization
Telecommand 1	24751	RHCP
Telecommand 2	24752	RHCP
Telemetry 1	17301	RHCP
Telemetry 2	17302	RHCP

Table 5-3. DIRECTV RB-1 TT&C Frequency and Polarization Plan

The telemetry and command link performance is summarized in the link budget analysis in Appendix C. The antenna patterns for the TT&C subsystem are discussed in Section 7.3. The emission designators associated with the TT&C subsystem will be 1M00F9D for both command and telemetry. The associated allocated bandwidth is 1 MHz for each of these emissions.

6. Orbital Locations

DIRECTV seeks to locate the DIRECTV RB-1 satellite at 99.175° W.L. orbital location, where it will be collocated with the SPACEWAY 2 and (when launched) DIRECTV 11 satellites. This will enable DIRECTV to use a single dish to receive signals from all three satellites. The only other non-DIRECTV satellite within 0.4º of this orbit location is the Galaxy-16 satellite operated by Intelsat at 99.0° W.L. Physical coordination of DIRECTV RB-1 with these other satellites is discussed in Section 18.

7. Predicted Spacecraft Antenna Gain Contours

7.1 Uplink Beams

The satellite will receive communications signals from the DIRECTV uplink facilities in Moxee, WA and Tucson, AZ. The receive antenna gain contour for the DIRECTV RB-1 receive beam is given in GXT format in the accompanying Schedule S.

7.2 Downlink Beams

DIRECTV RB-1 will employ a single transmit antenna system for 17/24 GHz BSS service to provide U.S. national coverage. This antenna system will cover CONUS+Alaska+Hawaii and will be capable of transmitting across the frequency band 17.3-17.7 GHz using LHCP and RHCP. The peak transmit gain, and the antenna gain contour in GXT format, are given in the accompanying Schedule S. The gain contour for CONUS is also graphically depicted in Figure 7-1 below.

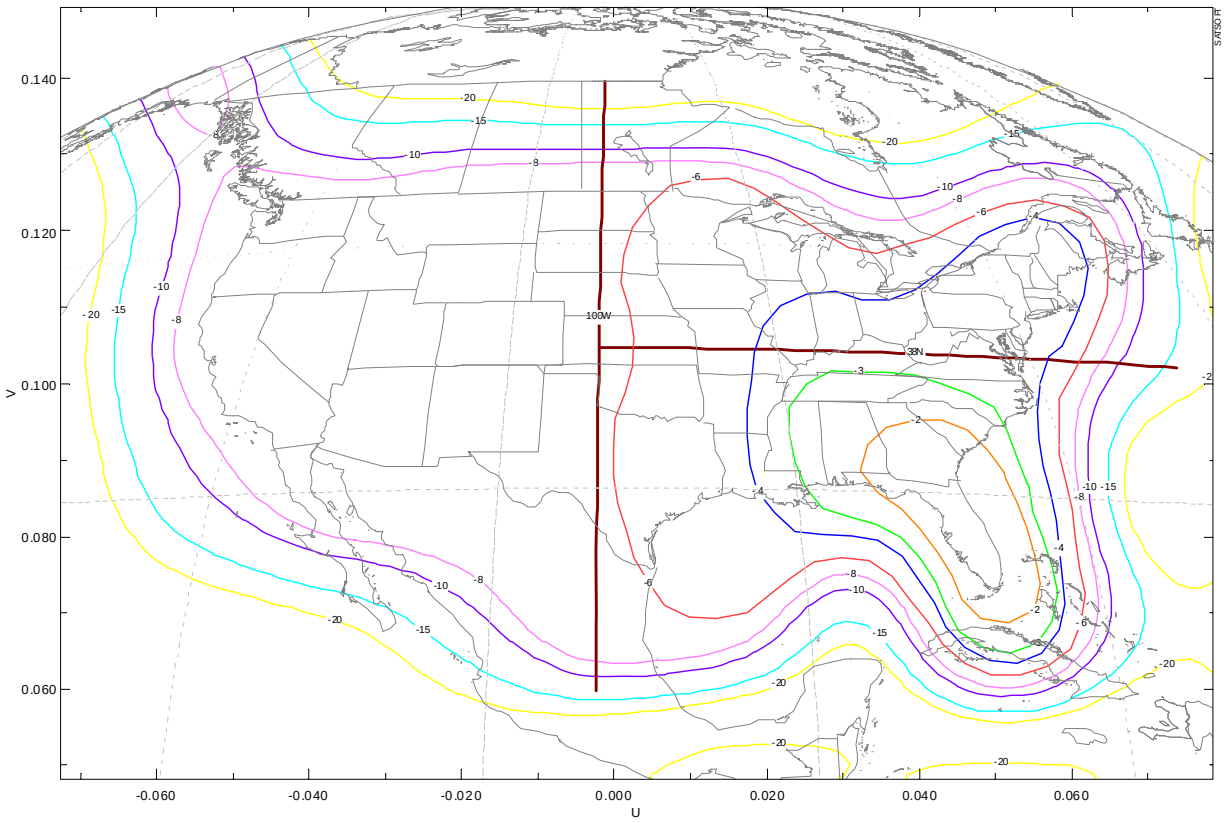


Figure 7-1. DIRECTV RB-1 Transmit Antenna Gain Contours

7.3 TT&C Beams

The TT&C coverage during transfer orbit and on-station contingency will be provided by the wide angle TT&C antennas, which will be oriented around the nominal +Z direction and the nominal –Z direction. The TT&C on-station coverage will be provided by the receive communications antenna for command and by the national beam transmit communications antenna for telemetry. The receive antenna pattern for on-station command and the transmit antenna beam pattern for on-station telemetry are given in GXT format in the accompanying Schedule S (see also Sections 7.1 and 7.2 above). The wide beam TT&C antenna coverage patterns are shown in Appendix B as Figure B-1.

8. Service Description, Link Performance Analysis, and Earth Station Parameters

8.1 Service Description

DIRECTV will use the DIRECTV RB-1 satellite to retransmit digital video and audio entertainment, educational and informational programming to subscribers throughout the United States, including Alaska, and Hawaii.

8.2 Link Performance

Representative communications link budgets for the DIRECTV RB-1 satellite are shown in Appendix A as Tables A-1 to A-4, *i.e.,* one for a city in each of the CONUS downlink power flux density ("PFD") regions defined by the Commission's rules, and one for a non-CONUS region (Alaska or Hawaii). Because DIRECTV is applying for an orbital location that is offset 0.175° from an Appendix F slot, these budgets include an entry for adjacent satellite interference ("ASI") from neighboring 17/24 GHz BSS satellites nominally spaced 3.825º, 4.175º, 7.825º and 8.175º away. The TT&C link budgets are shown in Appendix C as Tables C-1 and C-2.

8.3 Earth Station Parameters

There are essentially two types of earth stations to be used with the DIRECTV RB-1 satellite: feeder-link earth stations and subscriber terminals. The feeder-link stations will be relatively large transmit antennas, typically 9 to 13 meters, that track the satellite electronically and will be used for transmitting programming material from DIRECTV transmit facilities to the satellite. The subscriber terminals for reception in CONUS will be relatively small (65 cm) antennas located at subscribers' premises. Subscriber terminals for reception outside CONUS may need to be somewhat larger, approximately 1 meter.

9. Satellite Orbit Characteristics

The DIRECTV RB-1 satellite will be maintained in geosynchronous orbit at the 99.175º W.L. orbital location with a maximum N-S drift of ± 0.05°, and a maximum E-W drift of ± 0.05°. The antenna axis attitude will be maintained within a time-weighted 3σ value of ± 0.2° for all modes of operation.

10. Power Flux Density

The allowable PFD levels in the 17.3-17.7 GHz band are defined in Section 25.208(w) of the Commission's rules on a regional basis for all conditions, including clear sky, and for all methods of modulation as:

(1) In the region of the contiguous United States, located south of 38º North Latitude and east of 100º West Longitude: -115 dBW/m^2/MHz;

(2) In the region of the contiguous United States, located north of 38º North Latitude and east of 100º West Longitude: -118 dBW/m^2/MHz;

(3) In the region of the contiguous United States, located west of 100º West Longitude: -121 dBW/m^2/MHz; and

(4) For all regions outside of the contiguous United States including Alaska and Hawaii: -115 dBW/m^2/MHz.

As discussed in Section 5.2.2 above, the maximum downlink EIRP for DIRECTV RB-1 will be 63.0 dBW/36 MHz channel. DIRECTV calculates the maximum power flux density/MHz on the Earth's surface from this emission as: Max EIRP/channel minus spreading loss in direction of max gain minus atmospheric attenuation (at 17.5 GHz) minus bandwidth correction factor, or 63.0 dBW/36MHz – 162.4 (dB-m^2) – 1.1 dB (atmospheric) – 10log(36) = -116.1 dBW/m^2/MHz.

Because DIRECTV RB-1 will be placed at 99.175º W.L. rather than the Appendix F slot at 99° W.L., there will be 0.175º less spacing between DIRECTV RB-1 and the next closest on-grid location established in the *BSS R&O*. This slight offset results in 0.5

dB less discrimination from this adjacent location.[11] The maximum PFD calculated above, which is 1.1 dB less than the maximum allowed in Section 25.208(w)(1), accounts for this slight reduction in discrimination from this next closest location as required under Section 25.140(b)(4)(iii). This means that the DIRECTV RB-1 system is necessarily compliant with the PFD levels established in Sections 25.208(c) and 25.208(w)(1) and (4). As discussed in Section 7.2 above, the downlink antenna gain pattern for DIRECTV RB-1 is depicted in Figure 7-1 and included in GXT format in the accompanying Schedule S, and inspection of that pattern shows (1) that the antenna gain north of 38º North latitude and east of 100º W.L. is at least 3 dB below peak gain, and (2) that the antenna gain west of 100º W.L. is at least 6 dB below peak gain. As a result, the maximum PFD on the earth's surface complies with Section 25.208(w) in each of the applicable regions defined in the Commission's rules.

11. Arrangement for Tracking, Telemetry, and Control

DIRECTV has not yet contracted for the construction of the DIRECTV RB-1 satellite, and therefore has not yet finalized arrangements for tracking, telemetry and control. DIRECTV does, however, currently maintain a fleet of nine satellites as part of its existing business, and it is envisioned that TT&C for DIRECTV RB-1 would be done in a manner similar to that of DIRECTV's existing satellites.

12. Physical Characteristics of the Space Station

DIRECTV has not yet contracted for the construction of the DIRECTV RB-1 satellite and therefore has not yet settled upon exact specifications for the physical characteristics of the satellite. Accordingly, the payload envelope has been sized to allow more than one spacecraft currently available with extensive heritage and fully qualified

[11] This value is based on the reduction of topocentric angle and the assumption of a 45 cm receive antenna that meets the reference antenna pattern of Section 25.224.

technology to serve as the design platform. With this proviso, DIRECTV anticipates that the key spacecraft characteristics for DIRECTV RB-1 could be as summarized in the appropriate sections of the accompanying Schedule S.

13. Spacecraft Bus Subsystem

As discussed in Section 12 above, DIRECTV has not yet contracted with a manufacturer for the construction of the DIRECTV RB-1 satellite and DIRECTV does not wish to show a preference by providing data specific to any one manufacturer. As such, it is difficult to discuss any specific characteristics of what may comprise the spacecraft bus subsystem beyond that already specified in the accompanying Schedule S.

DIRECTV will provide the Commission with full spacecraft physical characteristics once a final spacecraft provider has been selected and a final satellite design has been adopted.

14. Common Carrier Status

DIRECTV intends to operate the DIRECTV RB-1 satellite on a non-broadcast, non-common carrier basis, as it operates its current DBS and Ka-band satellite capacity at its existing orbital locations. DIRECTV may sell and/or lease a portion of its capacity on a non-common carrier basis for complementary business purposes.

15. Schedule

DIRECTV will contract for, begin construction of, and launch and operate DIRECTV RB-1 in accordance with the milestones specified in Section 25.164(a) of the Commission's rules.

16. Public Interest Considerations

See Section I above.

17. Interference Analysis

In order to achieve maximum compatibility between diverse networks, the Commission has established coordination thresholds for earth station off-axis EIRP density and spacecraft PFD in Sections 25.223 and 25.208, respectively. As such, DIRECTV has assumed for the purposes of this application regional maximum downlink PFD values from neighboring systems consistent with Section 25.208(w), maximum feeder link earth station off-axis transmit power density consistent with Section 25.223 and receive earth station compliance with Section 25.224 (*i.e.*, Recommendation ITU-R BO.1213).

The interference analyses that are included in this application were performed in conjunction with the end-to-end link performance analyses. Abbreviated link budgets are presented in Tables A-1 through A-4 in Appendix A, *i.e.* one budget for each of the PFD regions defined in Section 25.208(w). In each case, the analysis includes the effects of adjacent satellite interference from satellites nominally spaced 3.825º, 4.175º, 7.825º and 8.175º away in evaluating whether the system accommodates the various data rates at acceptable C/(N+I) thresholds. Additionally, adjacent satellite interference was calculated assuming 0.5° mis-pointing of the receive antenna and 0.05° station-keeping of the interfering satellites. Tables A-1 to A-4 of Appendix A demonstrate that the DIRECTV RB-1 satellite design described in this application is compatible with the aforementioned transmission parameters and interference environment. Accordingly, the proposed 17/24 GHz BSS satellite would operate successfully in such an environment.

To properly account for interference from adjacent operating satellite systems, the uplink budgets include aggregate interference from earth terminals associated with satellites at 3.825º, 4.175º, 7.825º and 8.175º of orbit separation. On the uplink, the budgets include a level of interference that accounts for the maximum level of off-axis

EIRP permissible under Section 25.223. On the downlink, the satellites at 3.825º, 4.175º, 7.825º and 8.175º of orbit separation are each assumed to produce an interference level equivalent to the maximum PFD value permissible under Section 25.208(w) at that geographical location. In all cases it is shown that the system, as proposed, will be able to successfully operate in this interference environment. DIRECTV recognizes that it must accept any increased interference from compliant systems operating at Appendix F slots that may result from operating DIRECTV RB-1 at a slight offset from the on-grid slot at 99° W.L.

18. Orbital Debris Mitigation

DIRECTV intends to incorporate the material objectives set forth in this application into the technical specifications established for procurement and construction of DIRECTV RB-1. DIRECTV will include provisions for review of orbit debris mitigation as part of the preliminary design review and critical design review for the spacecraft, and for incorporation of these objectives, as appropriate, into its test plan, including a formal analysis of orbital debris risks associated with the TT&C, propulsion, and power generation and storage systems. Because this mitigation statement is necessarily forward looking, the process of procuring, designing, building, and testing may result in minor changes to the parameters discussed herein. If appropriate, DIRECTV will modify this mitigation statement to reflect such changes.

Spacecraft Hardware Design

DIRECTV has assessed and limited the amount of debris released in a planned manner during normal operations. DIRECTV RB-1 will not be a source of debris during launch, drift, or operating mode, as DIRECTV does not intend to release debris during the planned course of operations of the satellite.

DIRECTV will also consider the possibility of DIRECTV RB-1 becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control of the spacecraft and prevent post-mission disposal. As such, DIRECTV will take steps to address this possibility by incorporating redundancy, shielding, separation of components, and other physical characteristics into the satellite's design. For example, omni-directional antennas will be mounted on opposite sides of the spacecraft, and either will be sufficient to support orbit raising. The command receivers and decoders, telemetry encoders and transmitters, and the bus control electronics will be fully redundant, physically separated, and located within a shielded area to minimize the probability of the spacecraft becoming a source of debris due to a collision. DIRECTV will continue to review these aspects of on-orbit operations with the spacecraft manufacturer and will make such adjustments and improvements as appropriate to assure that its spacecraft will not become a source of debris during operations or become derelict in space due to a collision.

Minimizing Accidental Explosions

DIRECTV will contract for an overall spacecraft design that limits the probability of accidental explosion. The key areas reviewed for this purpose will include leakage of propellant and mixing of fuel and oxidizer as well as battery pressure vessels.
The basic propulsion design (including component and functional redundancy, and the placement of fuel tanks inside a central cylinder which provides a high level of shielding), propulsion subsystem component construction, preflight verification through both proof testing and analysis, and quality standards will be designed to ensure a very low risk of propellant leakage and fuel and oxidizer mixing that can result in subsequent explosions. During the mission, batteries and various critical areas of the propulsion subsystem will be continually monitored (for both pressure and temperature) to preclude

conditions that could result in the remote possibility of explosion and subsequent generation of debris.

After DIRECTV RB-1 reaches its final disposal orbit, all on-board sources of stored energy will be depleted, all fuel line valves will be left "open," any pressurized system will be vented, and all batteries will be left in a permanent discharge state. The solar cells will be slewed away from the sun to minimize power generation.

Through this process, DIRECTV will assess and limit the possibility of accidental explosions during mission operations and assure that all stored energy at the end of the satellite's operation will be removed.

Safe Flight Profiles

DIRECTV will assess and limit the probability of DIRECTV RB-1 becoming a source of debris by collisions with large debris or other operational space stations through detailed and conscientious mission planning. DIRECTV has reviewed the list of licensed systems and systems that are under consideration by the Commission for the nominal 99° W.L. orbital location it has requested. In addition, in order to address non-U.S. licensed systems, DIRECTV has reviewed the list of satellite networks in the vicinity of 99° W.L. for which a request for coordination has been submitted to the ITU. Only those networks that are operating, or are planned to be operating, within ± 0.4° have been taken into account in this review.

As a consequence of this review, it has been determined that only two other systems have been licensed by the Commission for, and are currently operating at, the nominal 99° W.L. location: SPACEWAY 2 at 99.115° W.L. and Galaxy-16 at 99.0° W.L. In addition, DIRECTV 11 will soon be launched to 99.225º W.L. Physical coordination of DIRECTV RB-1 with Galaxy-16, SPACEWAY 2, and DIRECTV 11 at the nominal 99° W.L. position will be required. As is stated in preceding text, the

DIRECTV satellites actually operate slightly offset from the 99.0º W.L. position, such that there is no overlap of the station-keeping volumes of these DIRECTV spacecraft with Galaxy-16 at that position. As for physical coordination with SPACEWAY 2 and DIRECTV 11, DIRECTV will carefully orchestrate orbit maneuvers of these two satellites with those of DIRECTV RB-1 to ensure that all three satellites are operated safely. In the worst case, DIRECTV will reduce the size of the station keeping boxes of all three of its satellites to ±0.025º, thereby resulting in no overlap between the station keeping boxes of these three satellites.

With regard to ITU filings within ±0.4 degrees of 99° W.L., the ITU has published requests for coordination for the following satellite networks:

- Canadian CAN-BSS-99.0 and CAN-BSS18 networks at 99° W.L.;
- United Kingdom UKSAT-7 network at 99° W.L.;
- Luxemburg LUX-G4-59A at 99° W.L.

DIRECTV can find no evidence that satellite construction contracts have been awarded for any of these networks, nor does the most recently available Federal Aviation Administration Commercial Space Station Report show any pending satellite launches for these networks.

Given the current absence of a construction contract for DIRECTV RB-1, it is difficult to assess what satellites will actually be operating at the nominal 99° W.L. position at the time that the satellite is to be launched. As such, DIRECTV will certainly revisit this issue once a satellite construction contract is in place. However, in the worst case, DIRECTV would resort to co-locating this satellite with its existing satellites at this position and self-coordinating this operation.

Frequency and physical coordination during orbital drift cannot be undertaken until the spacecraft and launch vehicle manufacturers are selected and a launch plan has been developed. No pre-operational orbits requiring special temporary authority are currently anticipated.

Post-Mission Disposal

Consistent with the requirements of Section 25.283(a) of the Commission's rules, at the end of the operational life of the satellite, DIRECTV will maneuver DIRECTV RB-1 into a disposal orbit with an altitude no less than that calculated using the IADC formula:

$$36{,}021 \text{ km} + (1000 \cdot C_R \cdot A/m).$$

Based on its experience with other satellites in its fleet, DIRECTV anticipates that, once the satellite's actual characteristics have been determined, this calculation will lead to a disposal orbit with a minimum perigee of somewhat less than 300 km above the normal GSO operational orbit.[12] Accordingly, DIRECTV currently anticipates that it will maneuver DIRECTV RB-1 to an altitude 300 km above GSO orbit at the end of its operational life, which should provide additional margin above the results of the IADC formula.

DIRECTV currently intends to allocate and reserve approximately 10 kg of propellant for final orbit raising maneuvers to this altitude. This value was determined through a detailed launch vehicle propellant budget analysis applied to the parameters of one of DIRECTV's most recently designed satellites. In addition, DIRECTV has assessed fuel gauging uncertainty and this budgeted propellant provides an adequate

[12] For example, the disposal orbit perigee calculated for the DIRECTV 9S satellite was approximately 281.5 km above GSO orbit altitude, which DIRECTV rounded up to 285 km to provide adequate margin.

margin of fuel reserve to ensure that the disposal orbit will be achieved despite such uncertainty.

III. ITU COST RECOVERY

DIRECTV is aware that, as a result of the actions taken at the 1998 Plenipotentiary Conference, as modified by the ITU Council in 2005, processing fees are now charged by the ITU for satellite network filings. As a consequence, Commission applicants are responsible for any and all fees charged by the ITU. DIRECTV hereby states that it is aware of this requirement and accepts responsibility to pay any ITU cost recovery fees associated with this application. Invoices for such fees may be sent to the contact representative listed in the accompanying FCC Form 312.

IV. CONCLUSION

The proposed space station will provide DIRECTV with a highly capable 17/24 GHz BSS satellite that will enhance its ability to provide high quality multichannel video service to millions of Americans.

For these reasons, DIRECTV submits that the proposed satellite will serve the public interest and respectfully requests that the Commission expeditiously grant this request.

Respectfully submitted,

DIRECTV ENTERPRISES, LLC

By: __/s/_____
Romulo Pontual
Executive Vice President

ENGINEERING CERTIFICATION

The undersigned hereby certifies to the Federal Communications Commission as follows:

(i) I am the technically qualified person responsible for the engineering information contained in the foregoing Application,

(ii) I am familiar with Part 25 of the Commission's Rules, and

(iii) I have either prepared or reviewed the engineering information contained in the foregoing Application, and it is complete and accurate to the best of my knowledge and belief.

Signed:

/s/
David Pattillo

January 14, 2008
Date

APPENDIX A

Link Budget Analysis

Table A-1. DIRECTV RB-1 Link Budget – Downlink to Miami

Miami	Clear Sky	Rain Up/Dn
Uplink		
Transmit power, dBW	7.4	11.1
Transmit losses, dB	1.2	1.2
Ground antenna gain, dB	65.2	65.2
Antenna pointing loss, dB	0.5	0.5
Free space loss, dB	211.8	211.8
Atmospheric loss, dB	2.0	2.0
Uplink rain loss, dB	0.0	5.0
Satellite G/T, dB/K	17.5	17.5
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Uplink C/N (thermal)	**28.4**	**27.1**
C/I (x-pol, NPR), dB	22.4	19.8
Total Uplink C/(N+I)	**21.4**	**19.1**
Downlink		
Satellite EIRP, dBW/36 MHz	63.0	63.0
Free space loss, dB	208.7	208.7
Gaseous	0.4	0.4
Cloud	0.6	0.6
Scintillation	0.3	0.3
Downlink rain loss, dB	0.0	6.0
Rain temp increase, dB	0.0	4.2
Rain + Atmos Loss, dB	1.1	7.1
Rcv. antenna pointing loss, dB	0.8	0.8
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	18.0	18.0
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N	**24.3**	**13.2**
Totals	**Clear Sky**	**Rain Up/Dn**
Uplink C/N (thermal), dB	21.4	19.1
Downlink C/N (thermal), dB	24.3	13.2
X-pol interference, dB	21.0	21.0
Aggregate C/I from ASI	21.1	21.1
Aggregate C/I from TX E/S	38.6	38.6
Adjacent Channel C/I, dB	20.0	20.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	**14.4**	**10.6**
Required C/(N+I), dB	**6.3**	**6.3**
Margin, dB	**8.1**	**4.3**

Table A-2. DIRECTV RB-1 Link Budget – Downlink to Chicago

Chicago	Clear Sky	Rain Up/Dn
Uplink		
Transmit power, dBW	7.4	11.1
Transmit losses, dB	1.2	1.2
Ground antenna gain, dB	65.2	65.2
Antenna pointing loss, dB	0.5	0.5
Free space loss, dB	211.8	211.8
Atmospheric loss, dB	2.0	2.0
Uplink rain loss, dB	0.0	5.0
Satellite G/T, dB/K	17.5	17.5
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Uplink C/N (thermal)	**28.4**	**27.1**
C/I (x-pol, NPR), dB	22.4	19.8
Total Uplink C/(N+I)	**21.4**	**19.1**
Downlink		
Satellite EIRP, dBW/36 MHz	59.0	59.0
Free space loss, dB	208.9	208.9
Gaseous	0.6	0.6
Cloud	0.7	0.7
Scintillation	0.4	0.4
Downlink rain loss, dB	0.0	3.0
Rain temp increase, dB	0.0	3.3
Rain + Atmos Loss, dB	1.3	4.2
Rcv. antenna pointing loss, dB	0.8	0.8
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	18.0	18.0
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N	**19.9**	**12.7**
Totals	**Clear Sky**	**Rain Up/Dn**
Uplink C/N (thermal), dB	21.4	19.1
Downlink C/N (thermal), dB	19.9	12.7
X-pol interference, dB	21.0	21.0
Aggregate C/I from ASI	16.9	16.9
Aggregate C/I from TX E/S	38.1	38.1
Adjacent Channel C/I, dB	20.0	20.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	**12.5**	**9.8**
Required C/(N+I), dB	**6.3**	**6.3**
Margin, dB	**6.2**	**3.5**

Table A-3. DIRECTV RB-1 Link Budget – Downlink to Los Angeles

Los Angeles	Clear Sky	Rain Up/Dn
Uplink		
Transmit power, dBW	7.4	11.1
Transmit losses, dB	1.2	1.2
Ground antenna gain, dB	65.2	65.2
Antenna pointing loss, dB	0.5	0.5
Free space loss, dB	211.8	211.8
Atmospheric loss, dB	2.0	2.0
Uplink rain loss, dB	0.0	5.0
Satellite G/T, dB/K	17.5	17.5
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Uplink C/N (thermal)	**28.4**	**27.1**
C/I (x-pol, NPR), dB	22.4	19.8
Total Uplink C/(N+I)	**21.4**	**19.1**
Downlink		
Satellite EIRP, dBW/36 MHz	55.5	55.5
Free space loss, dB	208.8	208.8
Gaseous	0.3	0.3
Cloud	0.2	0.2
Scintillation	0.2	0.2
Downlink rain loss, dB	0.0	1.3
Rain temp increase, dB	0.0	1.9
Rain + Atmos Loss, dB	0.6	1.8
Rcv. antenna pointing loss, dB	0.8	0.8
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	18.0	18.0
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N	**17.2**	**13.2**
Totals	**Clear Sky**	**Rain Up/Dn**
Uplink C/N (thermal), dB	21.4	19.1
Downlink C/N (thermal), dB	17.2	13.2
X-pol interference, dB	21.0	21.0
Aggregate C/I from ASI	13.5	13.5
Aggregate C/I from TX E/S	38.6	38.6
Adjacent Channel C/I, dB	20.0	20.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	**10.5**	**9.1**
Required C/(N+I), dB	**6.3**	**6.3**
Margin, dB	**4.2**	**2.8**

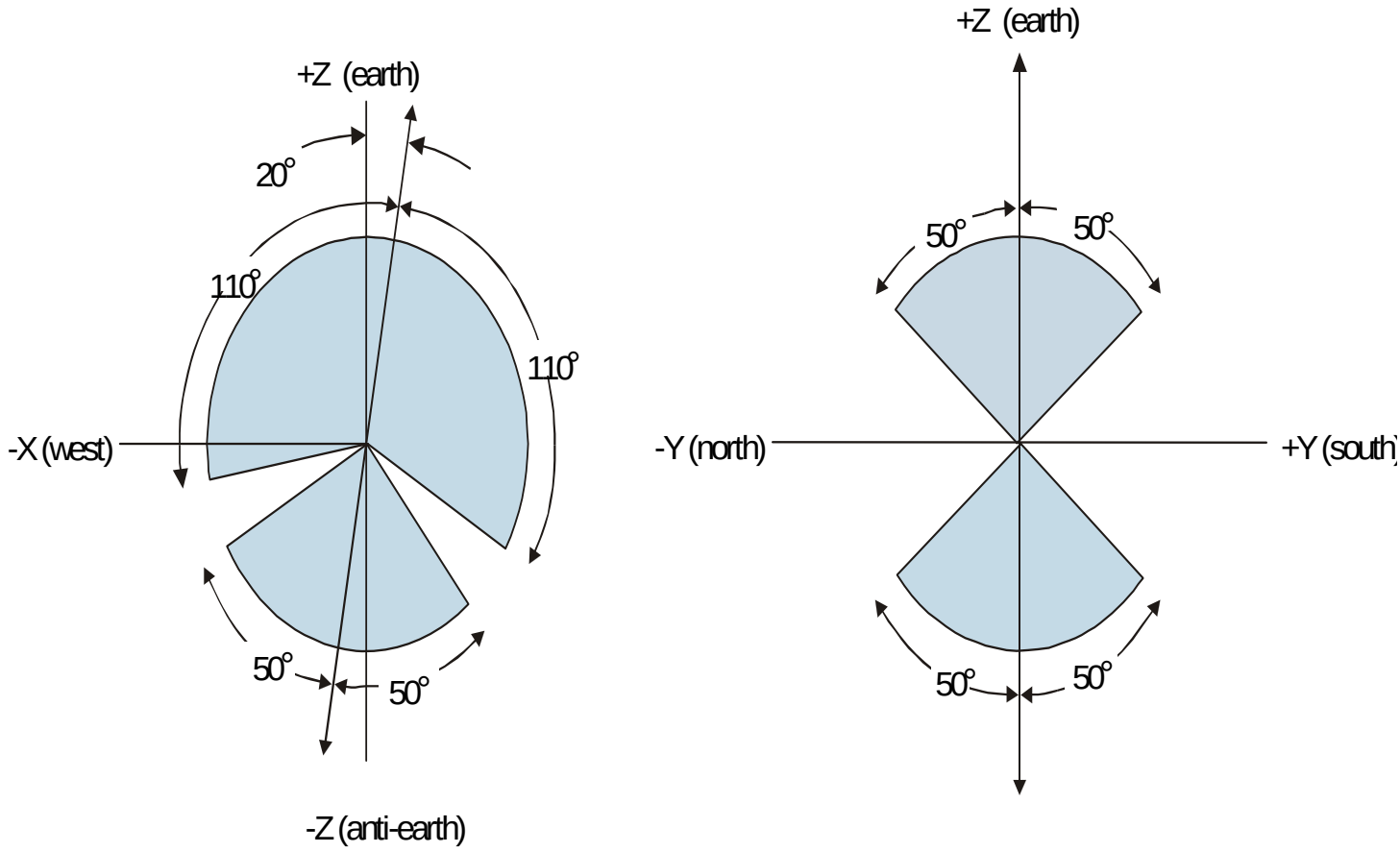
Table A-4. DIRECTV RB-1 Link Budget – Downlink to Juneau

Juneau	Clear Sky	Rain Up/Dn
Uplink		
Transmit power, dBW	7.4	11.1
Transmit losses, dB	1.2	1.2
Ground antenna gain, dB	65.2	65.2
Antenna pointing loss, dB	0.5	0.5
Free space loss, dB	211.8	211.8
Atmospheric loss, dB	2.0	2.0
Uplink rain loss, dB	0.0	5.0
Satellite G/T, dB/K	17.5	17.5
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Uplink C/N (thermal)	**28.4**	**27.1**
C/I (x-pol, NPR), dB	22.4	19.8
Total Uplink C/(N+I)	**21.4**	**19.1**
Downlink		
Satellite EIRP, dBW/36 MHz	54.0	54.0
Free space loss, dB	209.3	209.3
Gaseous	1.3	1.3
Cloud	0.7	0.7
Scintillation	0.7	0.7
Downlink rain loss, dB	0.0	2.6
Rain temp increase, dB	0.0	3.2
Rain + Atmos Loss, dB	2.3	4.7
Rcv. antenna pointing loss, dB	0.8	0.8
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	21.8	21.8
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N	**17.2**	**10.6**
Totals	**Clear Sky**	**Rain Up/Dn**
Uplink C/N (thermal), dB	21.4	19.1
Downlink C/N (thermal), dB	17.2	10.6
X-pol interference, dB	21.0	21.0
Aggregate C/I from ASI	15.1	15.1
Aggregate C/I from TX E/S	38.6	38.6
Adjacent Channel C/I, dB	20.0	20.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	**11.2**	**8.3**
Required C/(N+I), dB	**6.3**	**6.3**
Margin, dB	**4.9**	**2.0**

APPENDIX B

Antenna Beam Diagrams

Figure B-1. DIRECTV RB-1 Wide-Area TT&C Beams



APPENDIX C

TT&C Link Budgets

Table C-1. DIRECTV RB-1 On-Station Telemetry Link Budget

DIRECTV RB-1 On-station Telemetry	LHCP/RHCP	Units
Frequency	17.3	GHz
Transmitter output power	-8.0	dBW
Total transmit losses	-5.0	dB
Antenna gain (EOC)	28.3	dBi
EIRP (EOC)	15.3	dBW
Spec	12.0	dBW
Margin	3.3	dB

Table C-2. DIRECTV RB-1 On-Station Command Link Budget

DIRECTV RB-1 On-station Command, EOC	Hi U/L	Lo U/L	Units
Frequency	24.25	24.25.	GHz
Incident flux density	-89.0	-108.0	dBW/m^2
Isotropic area	-49.15	-49.15	$dB\text{-}m^2$
Antenna gain	47.0	47.0	dBi
Total receive losses	-20.0	-20.0	dB
Command receiver input power	-81.15	-100.15	dBm
Command receiver threshold		-114.0	dBm
Margin		13.85	dB
Command receiver max input power	-70.0		dBm
Margin	11.15		dB