Call Sign: S2243 IBFS Nos.
SAT-LOA-19970605-00050
SAT-AMD-20051118-00225
SAT-AMD-20080114-00016
SAT-AMD-20080321-00079

COPY

75/76/77-SAT-P/LA-97

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



Application of

DIRECTV Enterprises, Inc.

for

Authority to Construct, Launch and
Operate an Expansion System of
Direct Broadcast Satellites

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June 5, 1997

DIRECTV @ 110° W.L.

File # Call Sign S2243 (or other identifier) Grant Date 7/28/09
Term Dates From To See conditions
Approved: Chief, Satellite Division
FEDERAL COMMUNICATIONS COMMISSION
GRANTED
International Bureau
with conditions

**Attachment to Grant**
**IBFS File Nos. SAT-LOA-19970605-00050, SAT-AMD-20051118-00225, SAT-AMD-20080114-00016, and SAT-AMD-20080321-00079**
**Call Sign: S2243**
**July 28, 2009**

DIRECTV Enterprises, LLC's (DIRECTV's) request for authority to construct, launch, and operate a 17/24 GHz Broadcasting-Satellite Service (BSS) space station, DIRECTV RB-4, at the 110.9° W.L. orbital location, which is offset 0.1° from the 111° W.L. location specified in Appendix F to the *17/24 GHz BSS Report and Order*, FCC 07-76, 22 FCC Rcd 8842 (rel. May 4, 2007), IS GRANTED.[1] Accordingly, DIRECTV is authorized to operate its 17/24 GHz BSS space station, DIRECTV RB-4, at the 110.9° W.L. orbital location using the 17.3-17.7 GHz (space-to-Earth) and the 24.75-25.15 GHz (Earth-to-space) frequency bands, at a reduced power and without full interference protection, in accordance with the terms and conditions contained in its application, the Federal Communication Commission's (Commission's) rules and the conditions of this attachment.

1. DIRECTV may operate its DIRECTV RB-4 space station at the 110.9° W.L. orbital location, up to power flux density (PFD) levels that are reduced from those specified in 47 C.F.R § 25.208(w) in accordance with the following calculation methodology: For a given location on the surface of the Earth at which the required PFD reduction value needs to be determined, calculate the topocentric angular separation '$\varphi$' of the 107.0° W.L. and 111° W.L. geostationary orbital locations, and the corresponding off-axis gain $G_{CO1}(\varphi)$ of the antenna specified in Section 25.224(a)(1) at that angular separation. For the same location on the surface of the Earth, also calculate the topocentric angular separation of the 107° W.L. and 110.9 ° W.L. geostationary orbital locations, and the gain of the antenna '$G_{CO2}(\varphi)$' specified in Section 25.224(a)(1) at that angular separation. Then, perform the subtraction $G_{CO2}(\varphi)$ - $G_{CO1}(\varphi)$. The result is the required reduction in the PFD from the value specified in Section 25.208(w). DIRECTV RB-4's space station transmissions shall meet the reduced PFD limits under all atmospheric conditions. The PFD levels of DIRECTV RB-4's transmissions shall not exceed the maximum PFD levels stated in its application.
2. DIRECTV shall maintain its 17/24 GHz BSS space station within an east/west longitudinal station-keeping tolerance of ± 0.05 degrees of the assigned 110.9° W.L. orbital location.
3. DIRECTV, when designing its system, is reminded to take into consideration the geographic service requirements of Section 25.225 of the Commission's rules. 47 C.F.R. § 25.225.

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[1] The application was placed on Public Notice as accepted for filing on July 2, 2008. Policy Branch Information, Satellite Space Applications Accepted for Filing, *Public Notice,* Report No. SAT-00535 (rel. July 2, 2008); Policy Branch Information, Satellite Space Applications Accepted for Filing, *Public Notice*, Report No. SAT-00537 (rel. July 11, 2008) (corrections). Comments were filed by Pegasus Development DBS Corporation (Pegasus) and SES Americom Inc. (SES) on August 1, 2008. No petitions to deny were filed against this application. In a comment filed on all pending 17/24 GHz BSS applications, including its own applications, Pegasus sought a "clarification" regarding Commission policies relating to 47 C.F.R. §§ 25.158(c) (prohibition on transfer of place in application queue) and 25.165 (bond requirement). The issues raised by Pegasus relate to a request to assign this application to Pegasus from DIRECTV Enterprises, LLC. IBFS File No. SAT-AMD-20080916-00188. We address that request in a separate Order, and not in this grant.

4. *Division of Spectrum at the 111° W.L. Appendix F Orbital Location.*[2] Grant of this application is subject to the provisions regarding division of spectrum contained in Section 25.158(d) of the Commission's rules. Accordingly, in the event that applications relating to call sign S2441 at the 111° W.L. Appendix F orbital location are also granted, the available bandwidth at the orbital location will be divided among the licensees at this location.[3] The following procedures apply to the selection of spectrum by DIRECTV:

   a. *Ensuring Contiguous Bandwidth Selections.* Section 25.158(d)(6) requires that the each licensee's bandwidth selection shall not preclude other licensees from selecting contiguous bandwidth. To implement this requirement in the selection of bandwidth at this location, operations for telemetry, tracking, and telecommand (TT&C), service-link, and feeder-link band will be as follows:

      i. *Downlink Transmissions.* Telemetry and beacon transmissions in the space-to-Earth direction may be conducted in an 11-megahertz band segment at 17.300-17.311 GHz, and/or a 11-megahertz band segment at 17.689-17.700 GHz. The remaining portions of the 17.3-17.7 GHz band may be used by DIRECTV for service links in the space-to-Earth direction.

      ii. *Uplink Transmissions.* Telecommand transmissions in the Earth-to-space direction may be conducted in an 11-megahertz band segment at 24.750-24.761 GHz, and an 11-megahertz band segment at 25.139-25.150 GHz. On our own motion, we grant a limited waiver of § 25.202(g) of the Commission's rules, 47 C.F.R. § 25.202(g), to permit TT&C operations in the 25.139-25.150 GHz band segment. Section 25.202(g) requires that "telemetry, tracking and telecommand functions for U.S. domestic satellites shall be conducted at either or both edges of the allocated band(s)." The allocated uplink band for this service is the 24.75-25.25 GHz uplink band segment. The 25.139-25.150 GHz uplink band segment is a necessary counterpart to the 17.689-17.700 GHz downlink band segment. We grant this limited waiver to allow productive use of the 25.139-25.150 GHz uplink band segment that would otherwise be unused. This waiver only applies to use of the 25.139-25.150 GHz uplink band segment at the 111° W.L. Appendix F orbital location. The remaining portions of the 24.75-25.15 GHz band may be used by DIRECTV for feeder links in the Earth-to-space direction.

   b. *Selection Process.* DIRECTV will be allowed to select the particular band segments it wishes to use (its "Selected Assignments") no earlier than 60 days before it plans to launch its satellite, and no later than 30 days before that date, by submitting a letter to the Secretary of the Commission. DIRECTV shall serve copies of this letter to the other 17/24 GHz BSS Licensees at the 111° W.L. Appendix F orbital location, pursuant to Section 1.47 of the Commission's rules.

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[2] For purposes of this condition, the 111° W.L. Appendix F orbital location means the precise 111° W.L. geostationary orbital location and other geostationary orbital locations offset from the 111° W.L. orbital location.

[3] At the 111° W.L. Appendix F orbital location, EchoStar applied for authority to operate in the 17.3-17.8 GHz (space-to-Earth) and the 24.75-25.25 GHz (Earth-to-space) frequency bands. In contrast, DIRECTV applied for authority to operate in the 17.3-17.7 GHz (space-to-Earth) and the 24.75-25.15 GHz (Earth-to-space) frequency bands. Accordingly, there is no need to divide the 17.7-17.8 GHz (space-to-Earth) and the 25.15-25.25 GHz (Earth-to-space) frequency bands at this orbital location, and those bands are not subject to this condition.

i. *Selection of Downlink TT&C.* DIRECTV may make up to two telemetry and/or beacon downlink frequency channel selections in the 17.3-17.7 GHz TT&C band segments with a bandwidth of one megahertz each: one in the 17.300-17.311 GHz TT&C band segment, and one in the 17.689-17.700 GHz TT&C band segment.

ii. *Selection of Uplink TT&C.* In the 24.75-25.15 GHz TT&C band segments, DIRECTV may make up to two telecommand uplink frequency channel assignment selections with a bandwidth of one megahertz each: one in the 24.750-24.761 GHz TT&C band segment, and one in the 25.139-25.150 GHz TT&C band segment.

iii. *Selection of Spectrum within the 17.3-17.7 GHz band for Service-Link Operations and within the 24.75-25.15 GHz band for Feeder-Link Operations.* In the 17.3-17.7 GHz band segment, the Selected Assignment shall give DIRECTV access to 1/m of the quantity of spectrum in the band segment, for transmission on a primary basis, where "m" is the number of 17/24 GHz BSS Licensees authorized to provide service in the band segment at the 111° W.L. Appendix F orbital location at the time the Selected Assignment is chosen. In the 17.3-17.7 GHz band segment, the Selected Assignment shall be chosen such that the lower band edge of the assignment is an integer multiple of 378/m megahertz from the band edge of the lower TT&C band segment, at 17.311 GHz, and the upper band edge of the assignment is 378/m megahertz above the lower band edge of the assignment. The edges of the corresponding feeder-link Selected Assignment shall be 7450 MHz above the lower and upper band edges of the service-link Selected Assignment.

c. *Operations Within and Outside of the Selected Assignments.* DIRECTV shall operate on a primary basis relative to the other 17/24 GHz BSS Licensee within its Selected Assignments. DIRECTV may also operate in other portions of the 17.3-17.7 GHz, and 24.75-25.15 GHz frequency bands outside its own Selected Assignments on a secondary basis with respect to operations of the other 17/24 GHz BSS Licensee in its respective Selected Assignments. Each 17/24 GHz BSS Licensee at the 111° W.L. Appendix F orbital location that launches a satellite to that location shall serve a Notice of Successful Launch, by letter to the Chief, Satellite Division, International Bureau, Federal Communications Commission. Copies of the letter shall be served on the other 17/24 GHz BSS Licensee at the 111° W.L. Appendix F orbital location, pursuant to Section 1.47 of the Commission's rules. Within one week of receiving written notice of a successful launch, any 17/24 GHz BSS Licensee operating at the 111° W.L. Appendix F orbital location within the Selected Assignments of the newly launched satellite will be required to cease operations on such selected assignments.

5. DIRECTV's authorization for a 17/24 GHz BSS space station at the 110.9° W.L. orbital location will be null and void with no further action on the Commission's part if the space station is not constructed, launched, and placed into operation in accordance with the technical parameters and terms and conditions of this authorization by these specified time periods following the date of authorization:

a. Execute a binding contract for construction within one year (July 28, 2010);
b. Complete the Critical Design Review within two years (July 28, 2011);
c. Commence construction within three years (July 28, 2012);

d. Launch and begin operations within five years (July 28, 2014); and
e. DIRECTV must file a bond with the Commission in the amount of $3 million, pursuant to the procedures set forth in Public Notice, DA 03-2602, 18 FCC Rcd 16283 (2003), within 30 days of the date of this grant (August 27, 2009).

6. DIRECTV must complete coordination of the physical operations of the space station with operators of space stations with overlapping station-keeping volumes within two years and two months of grant of this authorization. DIRECTV shall notify the Chief, Satellite Division, International Bureau, Federal Communications Commission, in writing, that coordination of the physical operations of the space station has been completed with operators of space stations with overlapping station-keeping volumes within ten business days of completion of such coordination. Failure to meet this condition shall render this authorization null and void.

7. DIRECTV shall file as a modification, no later than ten business days after completion of Critical Design Review, a revised statement detailing the post-mission disposal plans for the space station at end of life, including the quantity of fuel that will be reserved for post mission disposal maneuvers. The statement must disclose the altitude selected for a post-mission disposal orbit and demonstrate that the perigee altitude for a post-mission disposal orbit meets the requirements of Section 25.283(a) of the Commission's rules governing end-of-life disposal of geostationary satellite orbit space stations.

8. This authorization and all conditions contained herein are subject to the outcome of the Commission's rulemaking in IB Docket No. 06-123 and any requirements subsequently adopted therein.

9. DIRECTV shall prepare all necessary information that may be required for submission to the International Telecommunication Union (ITU) to initiate and complete the advance publication, international coordination, due diligence, and notification procedures for this space station, in accordance with the ITU Radio Regulations. DIRECTV shall be held responsible for all cost recovery fees associated with these ITU filings. No protection from interference caused by radio stations authorized by other Administrations is guaranteed unless coordination and notification procedures are timely completed or, with respect to individual Administrations, by successfully completing coordination agreements. Any radio station authorization for which coordination has not been completed may be subject to additional terms and conditions as required to effect coordination of the frequency assignments with other Administrations. 47 C.F.R. § 25.111(b).[4]

10. The license term for this 17/24 GHz BSS space station, Call Sign S2243, is 15 years, and will begin to run on the date that DIRECTV certifies to the Commission that the satellite has been successfully placed into orbit and its operation fully conforms to the terms and conditions of this authorization. 47 C.F.R. § 25.121(a). DIRECTV shall file this certification with the Chief, Satellite Division, International Bureau, Federal Communications Commission, within ten business days of the space station being put into operation.

[4] In its comments, SES requests that certain conditions relating to ITU procedures be included in each 17/24 GHz BSS authorization. Most of the conditions sought by SES are included in condition No. 9 of this grant, which is a standard condition on space station authorizations. SES, however, also seeks to impose a customer notification requirement. We see no reason to impose such a condition on this authorization at this time.

11. On June 30 of each year, DIRECTV shall file a report with the International Bureau and the Commission's Columbia Operations Center in Columbia, Maryland, containing the information current as of May 31 of that year pursuant to Section 25.210(l) of the Commission's rules. 47 C.F.R. § 25.210(l).

12. DIRECTV is afforded 30 days from the date of release of this grant and authorization to decline this authorization as conditioned. Failure to respond within this period will constitute formal acceptance of the authorization as conditioned.

13. This action is issued pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 C.F.R. § 0.261, and is effective immediately. Petitions for reconsideration under Section 1.106 or applications for review under Section 1.115 of the Commission's rules, 47 C.F.R. §§ 1.106, 1.115, may be filed within 30 days of the date of the public notice indicating that this action was taken.

Call Sign: S2243 IBFS Nos.
SAT-LOA-19970605-00050
SAT-AMD-20051118-00225
SAT-AMD-20080114-00016
SAT-AMD-20080321-00079

GRANTED
International Bureau
with conditions

File # _____

Call Sign S2243 Grant Date 7/28/09
(or other identifier)
Term Dates
From _____ To: See conditions

Approved: _____
Chief, Satellite Division

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| In the Matter of the Application of | ) | |
| DIRECTV Enterprises, Inc. | ) | File No. |
| For Authority to Construct, Launch and Operate an Expansion System of Direct Broadcast Satellites | ) | |

APPLICATION

DIRECTV Enterprises, Inc. ("DIRECTV"), a majority-owned subsidiary of Hughes Electronics Corporation, hereby requests authority to construct, launch and operate a system of six direct broadcast satellites, to be known as DIRECTV Expansion-1 (or DX-1) through DIRECTV Expansion-6 (or DX-6), which will provide advanced direct broadcast satellite services at 17.3-7.8 GHz. The proposed expansion system will provide service to the U.S. from three orbital locations: 96.5° W.L., 101° W. L. and 105.5° W. L.

DIRECTV is the United States' leading provider of DBS services. DIRECTV initiated its DBS service in June 1994, and presently provides full-CONUS DBS service using 3 high-powered HS 601 spacecraft employing dual mode 120/240 watt transponders. DIRECTV today provides approximately 175 channels of all-digital, entertainment, educational and informational programming to customers purchasing the DSS® [1] satellite receiving system, which features an 18-inch satellite dish antenna.

Although the multichannel video programming distributor ("MVPD") industry in which DIRECTV competes continues to be dominated by cable operators in most local markets, DIRECTV nevertheless has experienced tremendous growth since its inception, and currently serves in excess of 2.5 million subscribers nationwide. The Federal Communications Commission recently determined that DBS providers have a

[1] DSS® is a registered trademark of DIRECTV, Inc.

higher combined subscribership than any other MVPD alternative to incumbent cable systems,[2] and DIRECTV hopes to continue and advance that trend.

This proposed expansion system will provide attractive, competitive DBS programming and services across all portions of the forty-eight contiguous states (CONUS), Hawaii and major portions of Alaska. The use of 240 watt transponders will allow the utilization of antennas as small as 45 cm in diameter over most of CONUS. Satellite compatibility with existing modulation and coding schemes, as well as advanced modulation and coding schemes, will ensure economic utilization of this important spectrum for the entire life of each satellite.

The satellites will be used for direct-to-home and, secondarily, direct-to-business delivery of video, audio, data and multimedia services. The video services are anticipated to include NTSC (transported digitally), standard-definition and high-definition ATSC formats. These services will complement the existing satellite broadcasting business of DIRECTV using the band 12.2-12.7 GHz.

DIRECTV today is filing, concurrently with this application, a Petition for Rulemaking to allocate the 24.75-25.25 GHz band for the fixed satellite service ("FSS") in the Earth-to-space direction for "feeder links" for the broadcasting satellite service ("BSS"), and also to provide for use of the 17.3-17.8 GHz band in the space-to-Earth direction for BSS. These allocations will increase greatly the potential capacity of BSS systems, and will benefit U.S. consumers by permitting U.S.-licensed BSS operators to offer a much wider variety of programming and service offerings. DIRECTV requests expedited approval of this application and permission to begin operation by the year 2000 to implement the Commission's general goal of promoting increased competition among multichannel video programming distributors, including competition to incumbent cable television operators.

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[2] Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, CS Docket No. 96-133, Third Annual Report (released Jan. 2, 1997), at ¶ 39 ("1996 Competition Report").

ITEM A. Name and Address of Applicant

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ITEM C. System Description

1. Generally

The DIRECTV expansion satellite system will consist of a space segment and a ground segment. The space segment will consist of the in-orbit satellites and their associated launch vehicles. Each of the satellites will be capable of being launched by one of the currently available commercial launch vehicles. The six satellites will be located, in pairs, at the nominal orbital locations of 96.5°, 101° and 105.5° West Longitude. Each satellite will provide transmit coverage to CONUS, Hawaii and major portions of Alaska in the band 17.3-17.8 GHz. Each satellite will be capable of receiving transmissions from CONUS in the band 24.75-25.25 GHz.

The DIRECTV expansion band ground segment will consist of: (i) earth stations to perform the necessary telemetry, tracking and command ("TT&C") functions for the satellites, (ii) earth station(s) to provide the communications uplink signal(s) and (iii) receive-only antennas to provide direct-to-home services.

Satellite TT&C operations will be performed by DIRECTV's affiliate PanAmSat or another respected satellite services provider. PanAmSat owns and operates an Operations Control Center ("OCC") in Long Beach, California, which performs the complex tasks associated with on-orbit satellite operations. This OCC currently provides the hands-on operational control of DIRECTV's existing three-satellite DBS fleet. Hughes Space and Communications Company, another DIRECTV affiliate, operates a separate Mission Control Center ("MCC") in El Segundo, California, which directs each satellite through transfer orbit and on-orbit deployment activities and performs in-orbit

testing once the satellite is in its geostationary position. Once operational, spacecraft control is handled entirely by the OCC.

Current plans call for transfer orbit and on-station TT&C links to operate in the BSS band 12.2-12.7 GHz (downlink) and FSS band 14.0-14.5 GHz (uplink).

Telemetry data from each satellite will be received by a primary TT&C earth station and a backup TT&C earth station. Both stations will be located in the United States, at dispersed geographic locations, to ensure continued satellite support in the event of a major outage at one location. Information from the TT&C stations is transmitted to the OCC over communications lines where it is processed, archived and analyzed. Commands to control the spacecraft are issued from the OCC and subsequently routed to the TT&C earth stations for processing and uplinking to the satellite. Although the earth stations are under the overall control of the OCC, at least one TT&C station may operate independently of the OCC, if necessary. Separate license applications will be filed for the TT&C stations needed to support the DIRECTV expansion satellites.

DIRECTV anticipates that it will own and operate the majority of the transmit/receive stations used to communicate to its expansion satellites. These sites typically will use dishes in the 9-13 meter range to uplink digital carriers in the band 24.75-25.25 GHz. The stations will monitor the satellite downlink in the 17.3-17.8 GHz band. Depending on the final business plans, a number of those stations may be needed in different cities across the United States. Separate license applications will be submitted for these facilities.

Most receive-only antennas for reception of signals from the DIRECTV expansion satellites will be owned by the end users of the service. Through the use of shaped reflectors, the satellites will be able to focus their RF power on areas with the greatest population and heaviest rainfall. This will permit the use of 45 cm receive dishes over most of CONUS at an availability of at least 99.7% as indicated by the Crane rain model. For certain regions, larger dishes may be recommended to improve service availability and/or transponder throughput. This level of service quality will permit an integrated service offering with DIRECTV's existing DBS business at 12.2-12.7 GHz.

2. Services

The satellites will be used for direct-to-home and, secondarily, direct-to-business, delivery of television, audio, data and multimedia services. These services will complement DIRECTV's existing multichannel video programming distribution business at 12.2-12.7 GHz.

Direct-to-home video services using the proposed expansion system are anticipated to include NTSC (transported digitally) and standard-definition and high-definition ATSC formats. The ATSC streams will be encapsulated with modulation and

coding appropriate for satellite transmission. Increased video capacity is needed to both increase the number of channels and improve the technical quality of each channel available to subscribers. Channel demands are driven by the growing consumer interest in receiving niche services and a wider variety of entertainment, educational, informational and ethnic programming from multiple sources. The marketplace will expect increased technical quality as it is exposed to digital satellite and cable services, Digital-VHS, Digital Versatile Disk and terrestrial digital broadcasting. Although DIRECTV has improved both the quantity and quality of its video transmission by signal processing improvements, future major improvements must rely on access to additional capacity.

New data and multimedia services are also expected to require significant increases in satellite capacity. The multimedia information will be displayed on television or computer screens in formats similar to existing Internet web pages or CD-ROM multimedia. The first PCs capable of directly displaying satellite-delivered information should be in the marketplace before the end of 1997. The new data and multimedia services are expected to include financial, sports and news "tickers," information from Internet web sites, web-page-like information that complements certain television channels, and new multimedia formats with embedded full-motion MPEG2 video. This new delivery mechanism is also expected to be valuable for data delivery, on an efficient national basis, to businesses and the Small Office in the Home (SOHO). These delivered "data objects" are expected to include PC software updates, information from databases for use in spreadsheets and high quality graphics and video clips for use in business reports.

All the planned digital services will be transported using fixed-length packets and time-division multiplexing to provide high data rate streams. The streams will then be encoded and modulated using a satellite-optimized forward error control code and modulation. The planned technology is either the concatenated RS/convolutional coding and QPSK modulation currently employed by DIRECTV, or, possibly, an even more advanced technology that is more efficient in terms of information capacity per transponder.

ITEM D. General Technical Information

1. Operational Characteristics

a. Frequency Plan

The satellites will operate using the 24.75-25.25 GHz frequency band for Earth-to-space (uplink) transmissions and the 17.3-17.8 GHz frequency band for space-to-Earth (downlink) transmissions.

Each satellite will contain 16 active transponder channels, consisting of 24 MHz channels with a 29.16 MHz spacing. Each satellite pair employs full frequency reuse by using dual polarization for both uplink and downlink frequencies. Linear polarization will be utilized on the uplink and circular polarization on the downlink. The radio frequency and polarization plan is shown in Figure D-1. Center frequencies and polarization assignments are listed in Table D-1.

Current plans call for TT&C operation in the BSS band at 12.2-12.7 GHz (downlink) and the FSS band at 14.0-14.5 GHz (uplink) during transfer orbit and on-station operation. The exact frequencies will be selected after analysis of the existing and planned FSS and BSS systems in the neighborhood of 101° W. L. During transfer orbit, command signals will be received through a bicone antenna. When the satellite is at its final orbit position, the primary command uplink will utilize a dedicated tracking/command antenna, with a pipe antenna available as a backup.

DIRECTV requests transfer orbit and on-station telemetry in the 12.2-12.7 GHz band. This is to avoid interference between DBS feeder links at 17.3-17.8 GHz and TT&C stations in the same band, where these sites are co-located. DIRECTV believes that the 12.2-12.7 GHz band can accommodate these telemetry carriers without interference to communications traffic and other telemetry links serving expansion band BSS satellites.

It is important that the transfer orbit command frequency be in the 14.0-14.5 GHz band. A command link at 24 GHz would suffer greater atmospheric attenuation and would thereby increase the risk during transfer orbit, a critical phase. In addition, transfer orbit ground stations with 24 GHz command links do not exist and would need to be developed.

DIRECTV requests an on-station command link in the 14.0-14.5 GHz band to eliminate the need to fly two sets of command receivers, one pair at 14 GHz, and one at 24 GHz. Otherwise, switching capability between the two receivers would also need to be incorporated on the spacecraft, reducing reliability. Such switching between receivers would also reduce command uplink availability at 24 GHz due to atmospheric effects. DIRECTV believes that the 14.0-14.5 GHz band can accommodate these command carriers without interference to existing communications traffic. DIRECTV will submit such additional information as the Commission may require with respect to these proposed TT&C bands.