

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

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<i>Application of</i>)	
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DIRECTV ENTERPRISES, LLC)	Call Sign:
)	
For Authorization to Launch and)	File No. SAT-RPL-_____
Operate DIRECTV 14 at 99° W.L.)	
_____)	

**APPLICATION FOR AUTHORIZATION
TO LAUNCH AND OPERATE DIRECTV 14**

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**APPLICATION FOR AUTHORITY
TO LAUNCH AND OPERATE DIRECTV 14**

DIRECTV Enterprises, LLC (“DIRECTV”) hereby requests that the Commission authorize the launch and operation of DIRECTV 14, a geostationary Ka-band satellite¹ to be located at the nominal 99° W.L. position, where it will be collocated with, and serve to replace and/or supplement the existing on-orbit capacity of, the SPACEWAY 2 and DIRECTV 11 satellites. DIRECTV 14 will operate within the Ka-band spectrum licensed to DIRECTV at the 99° W.L. slot. The capabilities of this satellite will be carefully integrated with those of DIRECTV’s existing on-orbit Ka-band satellites at the nominal 99° W.L. orbital location in order to optimize the efficient use of valuable spectrum resources at that location and to incorporate redundancy to DIRECTV’s high definition (“HD”) programming operations. Grant of this application will promote the continuing development of HDTV services, enable DIRECTV to maintain its position as the leader in digital home video entertainment and innovation, and enhance DIRECTV’s

¹ Note that DIRECTV 14 is a hybrid Ka FSS-17/24 GHz BSS satellite. DIRECTV has been licensed for the 17/24 GHz BSS portion of this satellite under call sign S2711. This application addresses only the Ka-FSS portion of this satellite.

ability to continue to offer U.S. consumers a powerful alternative to the services of incumbent cable operators.

DIRECTV will begin construction of DIRECTV 14, at its own risk,² and expects the satellite to be ready for launch and operation by the end of next year. Accordingly, DIRECTV requests that the Commission grant this application as expeditiously as possible.

I. GRANT OF THIS APPLICATION WOULD SERVE THE PUBLIC INTEREST

Over the past seven years, DIRECTV has demonstrated the suitability of Ka-band spectrum for delivery of high quality multichannel video programming directly to consumers, helping to unlock the enormous potential of this band. With five Ka-band satellites currently providing direct-to-home services,³ DIRECTV has been able to achieve a quantum leap in the amount of HD digital television programming – including local broadcast stations in HD – available to consumers throughout the country. Nearly 60% of new DIRECTV subscribers, and over 50% of the total DIRECTV customer base, subscribe to HD services. Continuing its tradition as the leader in innovative digital television services, DIRECTV intends to continue its development of advanced services and augment its impact for American consumers. In this application, DIRECTV seeks authority to launch and operate another vital element in its strategy to maintain its leadership position as an innovator in the digital revolution and to continue to promote the nation's transition from analog to HD television.

² See 47 C.F.R. 25.113(f).

³ DIRECTV transmits programming directly to consumers from the DIRECTV 10, DIRECTV 12 and SPACEWAY 1 satellites at the nominal 103° W.L. location and from the DIRECTV 11 and SPACEWAY 2 satellites at the nominal 99° W.L. location. DIRECTV also operates Ka-band payloads on the DIRECTV 8 and DIRECTV 9S satellite at the nominal 101° W.L. location, but those are used for backhaul distribution rather than provision of programming directly to subscribers.

DIRECTV 14 will be used to further expand DIRECTV's capability to provide HD services to American consumers. The satellite is fully compliant with Commission rules relating to Ka-band blanket earth station licensing.⁴ Its operations will be carefully integrated with those of DIRECTV's existing on-orbit Ka-band satellites at the nominal 99° W.L. orbital location in order to optimize the efficient use of valuable spectrum resources at that location and to incorporate redundancy to DIRECTV's HD operations. Combined with the SPACEWAY 2 and DIRECTV 11 satellites operating at 99° W.L., this satellite will give DIRECTV the ability to broadcast an additional ninety six channels of national HD programming. The satellite will also be capable of supporting forty-six spot beams that will allow DIRECTV to expand its current HD local-into-local service and enhance HD service into Hawaii and Puerto Rico.⁵

By granting this application, the Commission will enable DIRECTV to continue at the forefront of the development and delivery of HD television services, including local HD programming. This capability will allow DIRECTV to maintain its leadership in digital entertainment and innovation and further enhance DIRECTV's ability to compete with incumbent cable operators to provide the best possible programming service to American consumers.

For the foregoing reasons, DIRECTV respectfully submits that grant of this application would serve the public interest and requests that the Commission act expeditiously so that DIRECTV can proceed to complete construction and launch DIRECTV 14 late next year or early in 2014.

⁴ See 47 U.S.C. §§ 25.138, 25.208.

⁵ DIRECTV 14 has been designed with the capability of performing national and spot beam transmissions from 99° W.L., or national transmissions from the 103° W.L. location (should it be repositioned to 103° W.L. at some time in the future). DIRECTV is only seeking authority to operate DIRECTV 14 at the 99° W.L. location at this time.

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

1. Name, Address, and Telephone Number of Applicant

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El Segundo, CA 90245
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2. Name, Address, and Telephone Number of Counsel

William M. Wiltshire
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3. Type of Authorization Requested

DIRECTV hereby applies for authority to launch and operate DIRECTV 14, a Ka-band satellite that will provide DIRECTV with the capability to add approximately ninety six additional channels of national HD programming to DIRECTV's capabilities and also provide additional HD local-into local capability.

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

DIRECTV 14 will consist of a geostationary satellite located at the nominal 99° W.L. orbital location and associated ground station equipment. DIRECTV 14 is designed to provide DTH service in the FSS Ka-band (19.7-20.2 GHz (space-to-earth) and 29.5-30.0 GHz (Earth-to-space)). The transfer orbit and on-station Telemetry, Tracking and Control ("TT&C") functions will be provided at the edges of the frequency bands allocated for FSS Ka-band operations.

The DIRECTV 14 satellite is capable of supporting sixteen Ka-band transponders (eight LHCP and eight RHCP) providing national channels and eight Ka-band transponders (four LHCP and four RHCP) providing local-into-local transmissions. The national channels will be delivered to the 48 contiguous states (CONUS) plus Alaska,

Hawaii and Puerto Rico and will carry national HD programming material. DIRECTV 14 will also carry local programming material to a number of designated market areas and Puerto Rico. All national programming material will be distributed from the DIRECTV broadcast facilities in Los Angeles, CA, and Long Beach, CA, whereas local programming material will be transmitted from the infrastructure used to support such transmissions to DIRECTV's other Ka-band spot beam capable satellites. Using this combination of uplink facilities, the DIRECTV 14 system, operating in concert with DIRECTV's other Ka-band assets, will be capable of transmitting approximately 96 additional national channels of HD programming and will provide local-into-local capabilities in 69 designated market areas ("DMAs") and Puerto Rico.

5. Operational Characteristics

5.1 Frequency and Polarization Plan

Details of the frequency and polarization plan of the DIRECTV 14 satellite, including the TT&C functions, are included in the accompanying Schedule S, which is hereby incorporated by reference as if fully set forth herein. The emission designator for transmission of communications signals in the uplink and downlink will be 36M0G7W. The allocated bandwidth for this emission is 36 MHz. Details of the interconnection capability of the DIRECTV 14 national coverage and spot transponders are included in the accompanying Schedule S.

5.2 Communications Payload

5.2.1 Uplink Transmissions

Each of the transponders on DIRECTV 14 is 36 MHz wide and is filtered by the input multiplexers and channel filters. Filtered signals are amplified by individual channel amplifiers with selectable fixed/automatic level control ("ALC") operating

modes prior to final amplification in the TWTA. ALC is the normal mode of operation for all channels and this mode has a minimum input dynamic range of 19 dB and a commandable output power range of 20 dB for spot channels with a step size of 0.25 dB, and 13 dB for national beam channels with a step size of 0.5 dB. The fixed gain mode of operation has 19 dB of gain step attenuation, settable in approximately 1 dB steps.

The maximum expected G/T performance for DIRECTV 14 for the antennas directed towards the various uplink site locations is shown in the accompanying Schedule S. Note that this G/T value is for beam peak, and the beam pointing will be optimized to place each broadcast site at or near beam peak. Also note that this value of G/T will decrease, dB-for-dB, as the uplink location moves away from beam peak.

DIRECTV 14 will employ input multiplexer (IMUX) filter assemblies consisting of receive channel filters to limit the bandwidth of the received signals. A representative response characteristic of these filters is shown in Table 5-1.

Parameter	Frequency (F_c)	Specification
Insertion Loss Variation	±10 MHz	0.11 dB _{p-p}
	±12 MHz	0.23 dB _{p-p}
	±14MHz	0.48 dB _{p-p}
	±16 MHz	1.00 dB _{p-p}
	±18 MHz	2.33 dB _{p-p}
Out of Band Rejection	±22 MHz	18.3 dB
	±30 MHz	32.9 dB
	±50 MHz	34.8 dB

Table 5-1. Specified Response Characteristic of DIRECTV 14 National and Spot Input Channel Filter

5.2.2 Downlink Transmissions

The national coverage downlink beam uses dual combined output amplifiers (“TWTAs”) with a per amplifier output power of 130 Watts (*i.e.*, 260 Watts combined). The spot downlink beams use single amplifier TWTAs with an output power of 70 Watts

or 130 Watts. The resultant effective transmit power from each of these two types of amplifier assemblies is shown in the accompanying Schedule S.

The output filtering for the national and spot beams is performed by output multiplexer filters with slightly different in-band characteristics. A representative response characteristic for the national beam OMUX channel filters is shown in Table 5-2 and for the spot beam channel filters is shown in Table 5-3.

Parameter	Frequency (F_c)	Specification
Insertion Loss Variation	±10 MHz	0.18 dB _{p-p}
	±12 MHz	0.30 dB _{p-p}
	±14MHz	0.50 dB _{p-p}
	±16 MHz	0.88 dB _{p-p}
	±18 MHz	1.86 dB _{p-p}
Out of Band Rejection	±22 MHz	13.4 dB
	±30 MHz	27.6 dB
	±50 MHz	28.8 dB

Table 5-2. Representative Response Characteristic of DIRECTV 14 National OMUX Channel Filter

Parameter	Frequency (F_c)	Specification
Insertion Loss Variation	±12 MHz	1.05 dB _{p-p}
	±14MHz	1.76 dB _{p-p}
	±16 MHz	3.00 dB _{p-p}
	±18.0 MHz	4.89 dB _{p-p}
Out of Band Rejection	±22 MHz	13.4 dB
	±30 MHz	27.6 dB
	±50 MHz	28.8 dB

Table 5-3. Representative Response Characteristic of DIRECTV 14 Spot 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 pointing beacon and 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 subsystem is configurable to accommodate the unique requirements of pre-launch, orbit raising, and on-station synchronous orbit operations. The command and telemetry frequencies for DIRECTV 14, which fall at the edges of the frequency range allocated for FSS Ka-band operations, are as shown in the accompanying Schedule S. The minimum cross-polarization isolation for the on-station command and telemetry antennas will be 27 dB.⁶

Note that the telecommand and pointing beacon are received using different carriers. The beacon is a continuous wave (CW) signal that is always received, in order to maintain proper pointing of the DIRECTV 14 spot beams. The telecommand carrier is modulated with data to a width of approximately 800 kHz. The emission designators associated with the TT&C subsystem are 800KF2D for command, 800KF2D for telemetry, and NON for beacon with associated allocated bandwidths of 800 kHz, 800 kHz and 0 Hz for each of these emissions, respectively.

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.

6. Orbital Locations

The DIRECTV 14 satellite will operate in conjunction with the DIRECTV 11 and SPACEWAY 2 satellites at the nominal 99° W.L. orbital location. The precise orbital location will be 99.235° W.L., as is also specified in the accompanying Schedule S.⁷

⁶ A request for waiver of the cross-polarization requirements set forth in Section 25.210(i)(1) of the Commission's rules is included with this application. To the extent necessary, DIRECTV is also requesting a waiver of Section 25.202(g) in light of the fact that this space station operates in a portion of the Ka-band but will conduct TT&C at the edges of a different portion the Ka-band frequencies allocated for FSS use.

⁷ Note that DIRECTV 11 is currently authorized to operate at 99.225° W.L. and SPACEWAY 2 is currently authorized to operate at 99.115° W.L. DIRECTV will be filing requests in the future to

DIRECTV is already authorized to operate over the 18.3-18.8 GHz and 19.7-20.2 GHz (space-to-Earth) and 28.35-28.6 GHz and 29.25-30.0 GHz (Earth-to-space) frequency bands at the nominal 99° W.L. location.

7. Predicted Spacecraft Antenna Gain Contours

7.1 Uplink Beams

The satellite will receive national communications signals from the DIRECTV broadcast centers in Los Angeles and Long Beach, CA and spot communications signals from the uplink sites used to feed the spot transponders of DIRECTV's other Ka-band spot beam satellites using both RHCP and LHCP. The GXTs for these uplink beams, while not attached directly to the Schedule S, are provided in a separate GIMS container database file as discussed in the next section. All uplink beams will have a minimum cross-polarization isolation of 27 dB.⁸

7.2 Downlink Beams

The national coverage for DIRECTV 14 will include CONUS plus Alaska, Hawaii and Puerto Rico using both RHCP and LHCP. In addition to this national coverage, DIRECTV 14 has forty-six spot beams that will carry local-into-local HD programming material to 69 DMAs and Puerto Rico. The transmit antenna gain contours for each of these forty-six spot beams are being provided in a GIMS container database as described below. All downlink beams will have a minimum cross-polarization isolation of 27 dB.

slightly modify the orbital locations of these two satellites such that the final configuration of these satellites will be DIRECTV 14 at 99.235° W.L., DIRECTV 11 at 99.185° W.L., and SPACEWAY 2 at 99.075° W.L., with the east-west station keeping of all three satellites maintained to within $\pm 0.025^\circ$.

⁸ A request for waiver of the cross-polarization requirements set forth in Section 25.210(i)(1) of the Commission's rules is included with this application.

The antenna gain contours for all DIRECTV 14 beams are provided herewith in GXT format. However, because of the large number of beams involved and the known problems of the Schedule S software in handling this number of beams, the GXT files have not been embedded in the Schedule S software file but are being provided separately to the Commission in the form of a GIMS container database.

7.3 TT&C Beams

During transfer orbit, signals commanding the satellite will be received via a wide angle coverage antenna, capable of supporting command operation in all mission phases including attitude anomalies. The command antenna coverage will be $\pm 110^\circ$ in the azimuth plane and $\pm 50^\circ$ in the elevation plane in the $+Z$ (*i.e.*, Earth) direction and $\pm 50^\circ$ in the azimuth and elevation planes in the $-Z$ (*i.e.*, anti-Earth) direction. A representation of the antenna patterns for these wide area coverage antennas is shown in Appendix B, Figure B-1. Normal on-station command of the satellite will be achieved through on-station command (OSC) and on-station telemetry (OST) horn antennas. The coverage patterns for these horn antennas are shown in Appendix B as Figures B-2 and B-3. The receive pattern of the beacon receive antenna is included in the accompanying Schedule S.

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

8.1 Service Description

As discussed more fully in Section I of this application, DIRECTV will use the DIRECTV 14 satellite to transmit HD digital video and audio entertainment, and educational and informational programming, including the HD signals of local broadcast stations, to customers throughout the United States who will receive this programming using small dish antennas.

8.2 Link Performance

Representative link budgets are shown in Appendix A as Tables A-1 and A-2 and assume a receive antenna size of 65 cm and also include the interference contribution for adjacent satellite interference from neighboring Ka-band satellites nominally spaced two degrees away. Table A-1 applies to the case of the national coverage beam and Table A-2 to the case of a typical spot beam. Note that an availability of 99.7% has been assumed for both of these budgets.

Representative link budgets for the telemetry and command links are shown in Appendix C as Tables C-1 and C-2, respectively.

8.3 Earth Station Parameters

There are essentially two types of earth stations that will be used with the DIRECTV 14 satellite – feeder-link earth stations and subscriber terminals. The feeder-link stations are relatively large transmit antennas, typically around 9 meters, that track the satellite electronically and are used for transmitting national and local-into-local HD programming material from the DIRECTV broadcast sites to the satellite. The subscriber terminals are effectively 65 cm receive antennas that are installed at the customers' premises and have fixed pointing, which is optimized at installation. Somewhat larger antennas may have to be used in Alaska, Hawaii and Puerto Rico.

9. Satellite Orbit Characteristics

The DIRECTV 14 satellite will be maintained in synchronous orbit at its nominal orbital location with a North-to-South drift tolerance of ± 0.05 degrees and an East-to-West drift tolerance of ± 0.025 degrees. The antenna axis attitude will be maintained so as to keep the beam pointing error to within ± 0.1 degrees for the national beam and to within $\pm 0.035^\circ$ for spot beams.

10. Power Flux Density

The national downlink beam of DIRECTV 14 will be operated so as to generate a maximum downlink EIRP of 58.6 dBW per 36 MHz channel and to thereby comply with the Ka-Band blanket licensing coordination threshold of -118 dBW/m²/MHz. Operation with this EIRP complies with the Commission's requirements as is demonstrated by virtue of the fact that, for a 36 MHz digital carrier, a satellite downlink EIRP of 58.6 dBW results in a maximum PFD of -119.1 dBW/m²/MHz on the surface of the Earth (*i.e.*, $58.6 \text{ dBW} - 162.1 \text{ dB-m}^2 - 10 \cdot \log(36) \text{ dB-MHz}$)⁹. The spot downlink beams of DIRECTV 14 will be operated at various maximum EIRP values, with the greatest EIRP being 60.1 dBW. The spreading loss from 99° W.L. to the downlink location of this particular spot beam will be 162.5 dB-m² and so the maximum EIRP density will be -118 dBW/MHz (*i.e.*, $60.1 \text{ dBW} - 162.5 - 10 \cdot \log(36) \text{ dB-MHz}$). In all cases the upper bound on system and individual link availability is determined by -118 dBW/m²/MHz, *i.e.* the downlink PFD coordination threshold established in Section 25.138 of the Commission's rules.

The satellite will also comply with the downlink PFD limits established in Section 25.208 of the Commission's rules, which are as follows:

- -115 dB (W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- $-115 + 0.5(d-5)$ dB (W/m²) in any 1 MHz band for angles of arrival *d* (in degrees) between 5 and 25 degrees above the horizontal plane; and
- -105 dB (W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

⁹ Note that the value of 162.1 dB-m² for spreading loss is the minimum value of such loss from the geostationary orbit.

The simple analysis above illustrates that the DIRECTV 14 operations will result in a PFD on the surface of the Earth that is within the Commission's requirements.

11. Arrangement for tracking, telemetry, and control

DIRECTV has contracted with Intelsat Satellite Operations to perform the TT&C operations for DIRECTV 14. The Intelsat control center is located in Long Beach, CA. The primary TT&C uplink will come from DIRECTV's Castle Rock Broadcast Center, in Castle Rock, CO. The backup TT&C uplink will come from DIRECTV's Northeast Uplink Facility in New Hampton, NH.

12. Physical and Bus Characteristics of the Space Station

The key spacecraft physical and bus characteristics are summarized in the accompanying Schedule S.

13. Common Carrier Status

DIRECTV intends to operate DIRECTV 14 on a non-broadcast, non-common carrier basis. DIRECTV may sell and/or lease a portion of its capacity on a non-common carrier basis for complementary business purposes.

14. Schedule

DIRECTV anticipates that Space Systems/Loral will complete construction of DIRECTV 14 in the fourth quarter of 2013 and that the satellite will be launched by the end of that year or in early 2014.

15. Public interest Considerations

See Section I above.

16. Interference Analysis

The Tables included in Appendix B demonstrate that the DIRECTV 14 satellite design described in this application will operate without exceeding the limits set by the Commission's two-degree spacing policy and implementing rules. Accordingly, the

proposed DIRECTV 14 satellite will remain in compliance with the relevant technical rules established by the Commission.

At Ka-band, in order to achieve maximum compatibility between diverse networks, the Commission established coordination thresholds for spacecraft downlink PFD in the *18 GHz Order*.¹⁰ This operational threshold was the outcome of the blanket licensing parameters coordinated by industry for Ka-band earth terminals. This DIRECTV 14 proposal is fully compatible with this aspect of the *18 GHz Order*. For U.S. service from 99° WL, the system complies with the established -118 dBW/m²/MHz PFD threshold, as well as the PFD limitations established in Section 25.208 of the Commission's rules.

The interference studies that are included in this application were performed in conjunction with the end-to-end link performance analyses. Abbreviated link budgets including both uplink and downlink are presented in Appendix A. In each case, the analysis included the aggregate effects of interference from adjacent satellite networks in evaluating whether the system will operate at acceptable C/(N+I) thresholds.

To properly account for all interference from adjacent operating satellite systems, aggregate interference from earth terminals and satellites associated with pairs of satellites at 2, 4, 6, and 8 degrees of orbit separation were included. The budgets used a level of assumed interference that accounts for the maximum level permissible under the Commission's rules. The aggregate adjacent system interference that results from these assumptions is included in the link budget Tables A-1 and A-2.

¹⁰ *Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Station 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 (2000) ("18 GHz Order").

17. Orbital Debris Mitigation

DIRECTV has incorporated the material objectives set forth in this application into the technical specifications established for construction of DIRECTV 14.

Spacecraft Hardware Design

DIRECTV has assessed and limited the amount of debris released in a planned manner during normal operations. DIRECTV 14 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 has also considered the possibility of DIRECTV 14 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 has taken 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 have been 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 are 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 the Chance of Accidental Explosions

DIRECTV, in direct consultation with Space Systems/Loral, has assessed and limited, to the maximum extent possible, the probability of accidental explosions during and after completion of mission operations. The key areas reviewed for this purpose have included 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 have been 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 14 reaches its final disposal orbit, all on-board sources of stored energy will be depleted, all fuel line valves will be left “open,” 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.

Safe Flight Profiles

DIRECTV has assessed and limited the probability of DIRECTV 14 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 99.235° 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 99.235° 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 $\pm 0.2^\circ$ of DIRECTV 14 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 within 0.2° of, the requested location for DIRECTV 14: SPACEWAY-2 at 99.115° W.L. and DIRECTV 11 at 99.225° W.L.. As noted above, the DIRECTV satellites actually operate slightly offset from the 99.0° W.L. position, such that there is no overlap of the station-keeping volumes of these DIRECTV spacecraft with any other satellite (including Galaxy 16 at the $99.0^\circ \pm 0.05^\circ$ W.L. location). As for physical coordination with SPACEWAY-2 and DIRECTV 11, as previously indicated, DIRECTV will be filing requests in the future to slightly modify the orbital locations of these two satellites such that the final configuration of all three satellites will be DIRECTV 14 at 99.235° W.L., DIRECTV 11 at 99.185° W.L., and SPACEWAY 2 at 99.075° W.L., with the station keeping of all three satellites maintained to within $\pm 0.025^\circ$. In this way there will be no overlap of station keeping volumes of any of these satellites with each other, or with any other satellites.

With regard to ITU filings within ± 0.2 degrees of the requested location for DIRECTV 14, the only satellite network for which the ITU has published any information is USASAT-70V, for which a Notification request (Part I-S) was published in BR IFIC 2710. This Notification request was submitted to the ITU by the United States on behalf of DIRECTV.

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 14 into a disposal orbit with an altitude no less than that calculated using the IADC formula:

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

where C_R is the solar pressure radiation coefficient of the spacecraft, and A/m is the Area to mass ratio, in square meters per kilogram, of the spacecraft. The relevant values for the DIRECTV 14 satellite are:

$$C_R = 1.25$$

$$A = 115 \text{ m}^2$$

$$m = 3382 \text{ kg}$$

Inserting these values into the equation yields the following results:

$$36,021 \text{ km} + (1000 \cdot 1.25 \cdot (115/3382)) = 36063.5 \text{ km}$$

Since geostationary altitude is generally considered to be 35,786 km,¹¹ this yields a desired disposal orbit of at least 277.5 km above the geostationary arc. DIRECTV intends to boost DIRECTV 14 to at least this height, and in fact will target a height of approximately 300 km above geostationary altitude.

DIRECTV currently intends to allocate and reserve approximately 14.6 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

¹¹ *Orbital Debris Mitigation*, ¶ 65.

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

In summary, the satellite proposed in this application will provide DIRECTV with a highly capable spacecraft that will support a significant increase in the availability of high quality HD multichannel video programming for millions of Americans. This new capability will advance the ongoing development of HD services, provide redundancy or replacement for DIRECTV's HD local-into-local operations, and enhance DIRECTV's ability to offer a powerful alternative to incumbent cable operators. Due to the advanced design of the proposed satellite, DIRECTV will be able to provide these benefits without the allocation of any additional spectrum or orbital locations.

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

Respectfully submitted,

DIRECTV ENTERPRISES LLC.

By: /s/ _____
Romulo Pontual
Executive Vice President and Chief
Technology Officer

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/

Jack Wengryniuk
Senior Director
DIRECTV Engineering

May 18, 2012

Date

APPENDIX A

DIRECTV 14 LINK BUDGET ANALYSIS

CONUS	Clear Sky	Rain Dn
LABC Uplink		
Transmit power, dBW	2.6	8.6
Transmit losses, dB	-2.0	-2.0
Ground antenna gain, dB	66.7	66.7
Antenna pointing loss, dB	-0.5	-0.5
Free space loss, dB	-213.4	-213.4
Atmospheric loss, dB	-1.0	-1.0
Uplink rain loss, dB	0.0	-6.0
Satellite G/T, dB/K	23.4	23.4
Bandwidth, dB-Hz	-74.8	-74.8
Boltzmann's constant, dBW/Hz K	228.6	228.6
Uplink C/N (thermal) (dB)	29.6	29.6
Washington, DC		
Satellite EIRP, dBW/36 MHz	54.6	54.6
Free space loss, dB	-209.9	-209.9
Downlink rain loss, dB	N/A	-4.6
Atmospheric loss, dB	-1.6	-1.6
Rain temp increase, dB	0.0	-3.1
Rcv. antenna pointing loss, dB	-1.0	-1.0
Antenna wetting + noise increase, dB	0.0	-1.0
Ground G/T, dB/K	18.4	18.4
Bandwidth, dB-Hz	-74.8	-74.8
Boltzmann's constant, dBW/Hz K	228.6	228.6
Downlink C/N (thermal) (dB)	14.3	10.2
	Clear Sky	Rain Dn
Uplink C/N (thermal), dB	29.6	29.6
Downlink C/N (thermal), dB	14.3	10.2
Total inter and intra-system C/I, dB (incl. x-pol, ASI, ACI, ABI, TX E/S)	8.5	8.5
Total C/(N+I), dB	7.5	6.2
Required C/(N+I), dB (includes implementation margin)	4.7	4.7
Margin, dB	2.8	1.5

Table A-1. DIRECTV 14 Link Budget – National Coverage

Spot Mode 4	Clear Sky	Rain Dn
CRBC uplink		
Transmit power, dBW	2.6	9.2
Transmit losses, dB	-2.0	-2.0
Ground antenna gain, dB	66.7	66.7
Antenna pointing loss, dB	-0.5	-0.5
Free space loss, dB	-213.2	-213.2
Atmospheric loss, dB	-1.0	-1.0
Uplink rain loss, dB	0.0	-6.6
Satellite G/T, dB/K	23.1	23.1
Bandwidth, dB-Hz	-74.8	-74.8
Boltzmann's constant, dBW/Hz K	228.6	228.6
Uplink C/N (thermal) (dB)	29.5	29.5
Albuquerque-Santa Fe NM		
Satellite EIRP, dBW/36 MHz	58.3	58.3
Free space loss, dB	-209.2	-209.2
Downlink rain loss, dB	N/A	-3.9
Atmospheric loss, dB	-1.0	-1.0
Rain temp increase, dB	0.0	-2.9
Rcv. antenna pointing loss, dB	-1.0	-1.0
Antenna wetting + noise increase, dB	0.0	-1.0
Ground G/T, dB/K	18.4	18.4
Bandwidth, dB-Hz	-74.8	-74.8
Boltzmann's constant, dBW/Hz K	228.6	228.6
Downlink C/N (thermal) (dB)	19.3	15.4
	Clear Sky	Rain Dn
Uplink C/N (thermal), dB	29.5	29.5
Downlink C/N (thermal), dB	19.3	15.4
Total inter and intra-system C/I, dB (incl. x-pol, ASI, ACI, ABI, TX E/S)	9.3	9.3
Total C/(N+I), dB	8.9	8.3
Required C/(N+I), dB (includes implementation margin)	6.4	6.4
Margin, dB	2.5	1.9

Table A-2. DIRECTV 14 Link Budget – Spot Coverage - Mode 4

APPENDIX B

TT&C ANTENNA BEAM CONTOURS

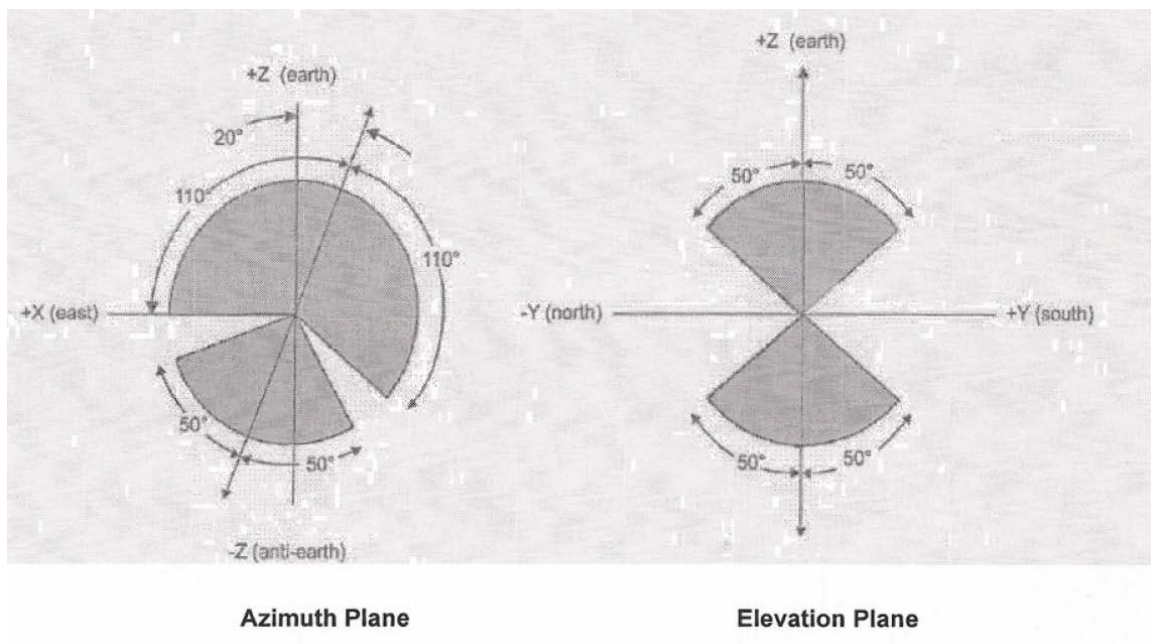


Figure B-1. DIRECTV 14 Wide Beam TT&C Antenna Coverage

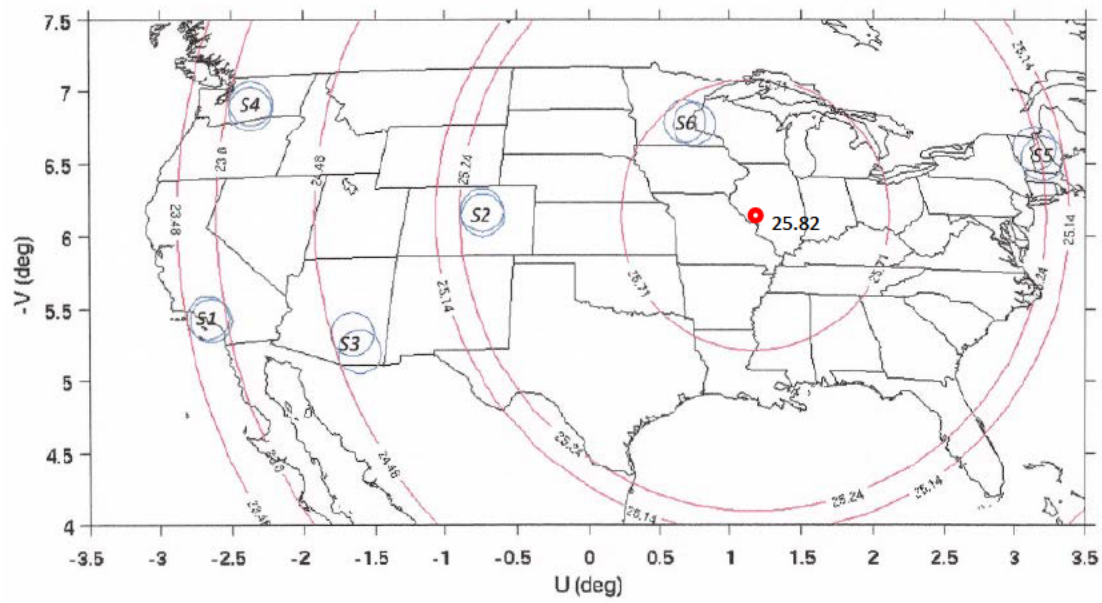


Figure B-2. DIRECTV 14 On-Station Command Antenna Coverage

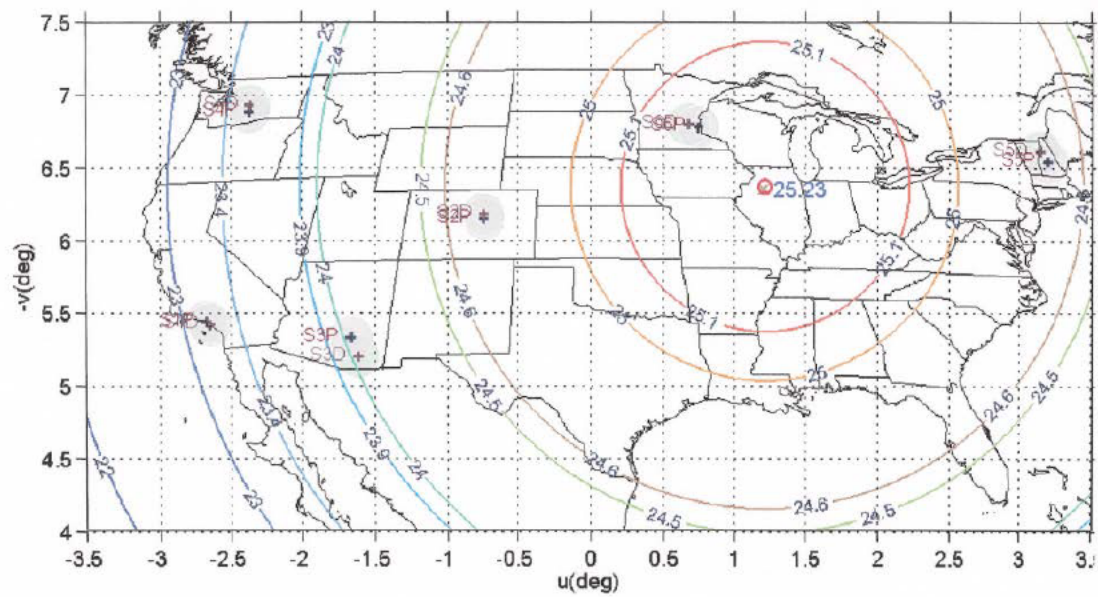


Figure B-3. DIRECTV 14 On-Station Telemetry Horn Antenna Coverage

APPENDIX C

TT&C LINK BUDGETS

Telemetry Link Analysis - On Station					
Earth Station: Castle Rock, North East		Castle Rock		North East	
Satellite: DTV14					
Parameter	Data	EOC	EOC		Unit
Frequency	18.799	18.7990	18.7990		GHz
E/S min Elevation		44.17	32.60		deg
2 Site Availability		99.9999	99.9999		%
Intermediate Calculations					
Path Loss		209.40	209.61		dB
Attenuation (clear sky)					
Atmospheric Losses		0.15	0.25		dB
Attenuation (rain)					
Total, Rain contribution		4.59	6.96		dB
Total loss		-214.14	-216.82		dB
Predicted Telemetry EIRP		19.35	19.31		dBW
Received Power at Ground Station		-194.79	-197.51		dBW
Ground Station G/T with intf		35.14	31.41		dB/K
Ground Station Pointing Error	-0.7	-0.70	-0.70		dB
Downlink C/No		68.25	61.80		dB-Hz
Telemetry Requirements					
Eb/No @1 * 10 ⁻⁶ BER	10.5	10.50	10.50		dB
Implementation loss	1.5	1.50	1.50		dB
Bit rate bandwidth (bps)	4800	36.81	36.81		dB-Hz
Required S/No		48.81	48.81		dB-Hz
Customer S/N + I		51.00	51.00		dB-Hz
Telemetry Margins					
	Mod Loss				
Normal Subcarrier	-4.13 dB	15.31	8.86		dB
Normal + Dwell or Ranging	-7.78 dB	11.66	5.21		dB
Normal + Dwell + Ranging Subcarriers	-11.52 dB	7.92	1.47		dB
Margin, dB		7.92	1.47		dB

Table C-1. On-Station Telemetry Link Budget

Command Link Analysis - On Station				
Earth Station: Castle Rock, North East		Castle Rock		North East
Satellite: DTV14				
Parameter	Data	EOC	EOC	Unit
Frequency	28.351	28.3510	28.3510	GHz
E/S Elevation		44.17	32.60	deg
2 Site Availability		99.9999	99.9999	%
Intermediate Calculations				
Path Loss		212.97	213.18	dB
Attenuation (clear sky)				
Atmospheric Losses		0.22	0.37	dB
Attenuation (rain)				
Total, Rain contribution		10.88	15.82	dB
Total loss		-224.07	-229.36	dB
E/S Uplink EIRP		88.00	88.00	dBW
Polarization Losses	0.0	0.00	0.00	dB
Uplink Flux Density (co-pol)		-85.57	-90.86	dBW/m2
Spacecraft Link Margins				
Spacecraft Antenna Gain		25.20	25.10	dB
Power Incident at Antenna		-136.07	-141.36	dBW
Receive Input Losses		-18.29	-18.33	dB
LNA Input Power (dBW)		-128.92	-137.12	dBW
LNA Rcvr Input Power (dBm)		-98.92	-107.12	dBm
LNA Command Input Threshold	-114.29	-114.29	-114.29	dBm
Margin, dB		15.13	9.70	dB

Table C-2. On-Station Command Link Budget