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

	
Application of)
DIRECTV Enterprises, LLC) Call Sign: S2711
For Minor Modification of the DIRECTV RB-1 Satellite in the 17/24 GHz Broadcasting Satellite Service at 99° W.L.) File No
)

APPLICATION FOR MINOR MODIFICATION

DIRECTV Enterprises, LLC ("DIRECTV") hereby requests that the Commission modify its license for DIRECTV RB-1, a geostationary satellite in the 17/24 GHz Broadcasting Satellite Service ("BSS") authorized to operate at the nominal 99° W.L. orbital location. This modification has three aspects. First, DIRECTV proposes to expand the current coverage area of DIRECTV RB-1 to include Puerto Rico. The minor modification to the coverage area of the satellite will enhance DIRECTV's ability to provide service in this U.S. territory, but will not create harmful interference to any other satellite system. Second, DIRECTV proposes to slightly modify the exact orbital location of the satellite, which will allow DIRECTV to safely co-locate this satellite with DIRECTV's existing satellites at this location. Third, DIRECTV provides post-mission disposal plans for this satellite, in

¹ See Grant Stamp, IBFS File Nos. SAT-LOA-20060908-00099, SAT-AMD-20080114-00013, SAT-AMD-20080321-00076 (granted July 28, 2009) ("DRB-1 Authorization").

Note that service to Puerto Rico is currently provided by a DIRECTV affiliate, DIRECTV Latin America, using leased satellite capacity.

satisfaction of a condition in its authorization.³ Accordingly, the proposed modification will serve the public interest while having no countervailing effects.

I. CHANGES TO PREVIOUS TECHNICAL INFORMATION

In this Application, DIRECTV seeks neither additional spectrum nor additional orbital resources, but only a slight modification to the coverage area of the satellite to include coverage of the U.S. territory of Puerto Rico, and a slight modification to the exact orbital location (from 99.175° W.L. to 99.235° W.L.) to allow this satellite to be safely co-located with other DIRECTV satellites at this location, consistent with the Commission's rules. In accordance with Section 25.117(d)(1) of the Commission's rules, DIRECTV identifies in this Application, Technical Annex, and associated Schedule S, only those items of information that have changed from its station license and associated application(s). DIRECTV hereby certifies that the remaining information in its station license and associated application(s) has not changed.

Changing the orbital location of DIRECTV RB-1 to 99.235° W.L. will facilitate future operations of this satellite with the two closest satellites, SPACEWAY 2 and DIRECTV 11, both of which are operated by DIRECTV. By slightly repositioning all three of these satellites⁴ and operating them within constrained orbital parameters, DIRECTV will ensure that there is no overlap in stationkeeping volumes among its satellites at this slot. In addition, the only satellite network request for coordination located within ±0.15 degrees of 99.235° W.L. published by the ITU is that for USASAT-70V, which was submitted to the ITU on behalf of DIRECTV. Accordingly, this slight change in location would complete

³ See DRB-1 Authorization, Condition 7.

Note that DIRECTV will submit applications requesting to modify the locations of SPACEWAY 2 and DIRECTV 11 at an appropriate time in the future.

physical coordination of the satellite with operators of space stations with potentially overlapping stationkeeping volumes, as required under the DRB-1 Authorization.⁵

In addition to the slight change in orbital location, the only aspect of the satellite's operations that will change as a result of adding this new coverage area is the predicted gain contours and peak EIRP. Accordingly, new contours are included in an accompanying Schedule S, along with any other technical parameters that have changed. In addition, a set of downlink gain contours are included in the Technical Annex attached hereto along with accompanying sample link budgets.

II. POST-MISSION DISPOSAL INFORMATION

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:

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

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 RB-1 satellite are:

$$C_R = 1.24$$

$$A = 112 \text{ m}^2$$

$$m = 3550 \text{ kg}$$

Inserting these values into the equation yields the following results:

$$36,021 \text{ km} + (1000*1.24*(112/3550)) = 36,060 \text{ km}$$

Since geostationary altitude is generally considered to be 35,786 km,⁶ this yields a desired disposal orbit of at least 274 km above the geostationary arc. DIRECTV intends to boost

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⁵ See DRB-1 Authorization, Condition 6.

DIRECTV RB-1 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 10 kg of propellant for final orbit raising maneuvers to this altitude. This value was determined through a detailed launch vehicle propellant budget analysis. In addition, DIRECTV has assessed fuel gauging uncertainty, and this budgeted propellant provides an adequate margin of fuel reserve to ensure that the disposal orbit will be achieved despite such uncertainty.

III. THE PROPOSED MODIFICATION WOULD SERVE THE PUBLIC INTEREST

DIRECTV is currently authorized to operate its DIRECTV RB-1 satellite at the 99.175° W.L. orbital location and it requests to modify this location by 0.06° to the west (*i.e.*, to 99.235° W.L.). This slight change will ultimately allow DIRECTV to safely co-locate DIRECTV RB-1 with the SPACEWAY 2 and DIRECTV 11 satellites already operating at the nominal 99° W.L. location. In addition to this change, the predicted antenna gain contour submitted in connection with the DIRECTV RB-1 authorization includes coverage of CONUS+Alaska+Hawaii, and DIRECTV requests that it be authorized to add the territory of Puerto Rico to the coverage area of this satellite. This modification will enable DIRECTV or one of its affiliates to enhance the services provided to Puerto Rico significantly, by both increasing the number of channels available and by providing more of those channels in high definition format. As a result, this change will allow DIRECTV to enhance competition, offering Puerto Rican consumers an even more robust multichannel video alternative to incumbent cable systems.

⁶ *Mitigation of Orbital Debris*, 19 FCC Rcd. 11567, ¶ 65 (2004).

Moreover, DIRECTV's proposal will achieve this benefit without causing harmful interference to any other operator. In fact, with the changes proposed for the downlink antenna pattern, the peak EIRP over CONUS will decrease from the previously authorized 63 dBW/36 MHz channel to approximately 58 dBW/36 MHz channel, and the peak EIRP over Puerto Rico will also be approximately 58 dBW. A figure illustrating the downlink antenna gain contours for the proposed revised downlink antenna pattern is shown in the attachment to this application.

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 38° North Latitude and east of 100° West Longitude: -115 dBW/m²/MHz;
- (2) In the region of the contiguous United States, located north of 38° North Latitude and east of 100° West Longitude: -118 dBW/m²/MHz;
- (3) In the region of the contiguous United States, located west of 100° West Longitude: 121 dBW/m²/MHz; and
- (4) For all regions outside of the contiguous United States including Alaska and Hawaii: -115 dBW/m²/MHz.

The maximum CONUS downlink EIRP for the revised DIRECTV RB-1 transmit antenna will be approximately 58.0 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 bandwidth correction factor, or $58.0 \text{ dBW/}36\text{MHz} - 162.4 \text{ (dB-m}^2) - 10\log(36) = -120 \text{ dBW/m}^2/\text{MHz}$. This maximum would occur at beam peak, over Florida and Puerto Rico, and as can readily be seen from the gain

contours in the attachment, this necessarily means that the revised DIRECTV RB-1 would easily comply with the allowable PFD levels defined in Section 25.208(w), with at least 4 dB of margin throughout the CONUS coverage area. Likewise, since the maximum EIRP of the satellite over Puerto Rico is approximately the same as that over CONUS, the maximum PFD would also be approximately the same and would again easily comply with the requirements of Section 25.208(w).

Because DIRECTV RB-1 will be placed at 99.235° W.L. rather than the Appendix F slot at 99° W.L., there will be 0.235° less spacing between DIRECTV RB-1 and the next closest on-grid location established in the *BSS R&O*. This slight offset results in approximately 0.7 dB less discrimination from this adjacent location. The maximum PFD calculated above, which is at least 4 dB less than the maximum allowed in Section 25.208(w)(1), more than 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(w)(1) through (4).

For the foregoing reasons, DIRECTV submits that grant of the proposed minor modification would serve the public interest and respectfully requests that the Commission expeditiously grant this request.

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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, Appendix F (2007) ("BSS R&O").

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.

IV. WAIVER PURSUANT TO SECTION 304 OF THE COMMUNICATIONS ACT

In accordance with Section 304 of the Communications Act of 1934, as amended, 47 U.S.C. § 304, DIRECTV hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise.

Respectfully submitted,

DIRECTV ENTERPRISES, LLC

By: \(\s\ \) Romulo Pontual
Executive Vice President

ENGINEERING CERTIFICATION

Th	e undersigned	hereby	certifies to	the	Federal	Communications	\mathbf{C}	ommission a	as	fol	lows

- (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		
July 26, 2011 Date		



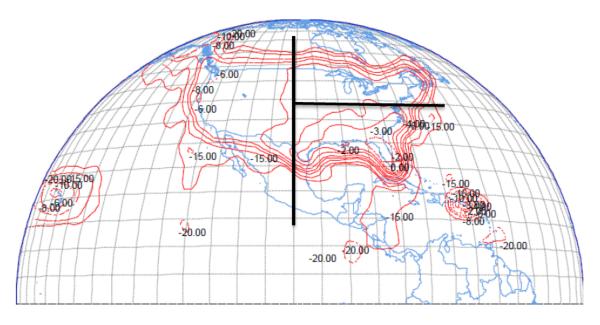


Figure A-1. Downlink Gain Contours for DIRECTV RB-1

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

Table A-1. DIRECTV RB-1 Lilik Bu	Clear Sky	Rain Up and Rain Dn
Uplink		
Transmit power, dBW	12.2	17.2
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	211.5	211.5
Atmospheric loss, dB	1.0	1.0
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) (dB)	34.5	34.5
C/I (x-pol, NPR), dB	25.0	25.0
Total Uplink C/(N+I), (dB)	24.5	24.5
Downlink		
Satellite EIRP, dBW/36 MHz	58.0	58.0
Free space loss, dB	208.7	208.7
Gaseous	0.4	0.4
Cloud	0.6	0.6
Scintillation	0.4	0.4
Downlink rain loss, dB	0.0	5.8
Rain temp increase, dB	0.0	4.0
Rain + Atmos Loss, dB	1.2	6.9
Rcv. antenna pointing loss, dB	1.0	1.0
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	17.9	17.9
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N, dB	18.8	8.1
Totals		
Uplink C/N (thermal), dB	24.5	24.5
Downlink C/N (thermal), dB	18.8	8.1
x-pol interference, dB	20.0	20.0
Aggregate C/I from ASI	18.0	18.0
Aggregate C/I from TX E/S	43.2	43.2
Adjacent Channel C/I, dB	25.0	25.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	13.4	7.2
Required C/(N+I), dB	4.7	4.7
Margin, dB	8.7	2.5

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

Table A-2. DIRECT V RD-1 Lilik Di	Clear Sky	Rain Up and Rain Dn
Uplink		
Transmit power, dBW	12.2	17.2
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	211.5	211.5
Atmospheric loss, dB	1.0	1.0
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), dB	34.5	34.5
C/I (x-pol, NPR), dB	25.0	25.0
Total Uplink C/(N+I), dB	24.5	24.5
Downlink		
Satellite EIRP, dBW/36 MHz	54.0	54.0
Free space loss, dB	208.8	208.8
Gaseous	0.4	0.4
Cloud	0.7	0.7
Scintillation	0.5	0.5
Downlink rain loss, dB	0.0	2.9
Rain temp increase, dB	0.0	3.3
Rain + Atmos Loss, dB	1.3	4.0
Rcv. antenna pointing loss, dB	1.0	1.0
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	17.9	17.9
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N, dB	14.7	7.6
Totals		
Uplink C/N (thermal), dB	24.5	24.5
Downlink C/N (thermal), dB	14.7	7.6
x-pol interference, dB	20.0	20.0
Aggregate C/I from ASI	17.0	17.0
Aggregate C/I from TX E/S	43.2	43.2
Adjacent Channel C/I, dB	25.0	25.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	11.5	6.8
Required C/(N+I), dB	4.7	4.7
Margin, dB	6.8	2.1

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

	Clear Sky	Rain Up and Rain Dn
Uplink		
Transmit power, dBW	12.2	17.2
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	211.5	211.5
Atmospheric loss, dB	1.0	1.0
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), dB	34.5	34.5
C/I (x-pol, NPR), dB	25.0	25.0
Total Uplink C/(N+I), dB	24.5	24.5
Downlink		
Satellite EIRP, dBW/36 MHz	51.0	51.0
Free space loss, dB	208.8	208.8
Gaseous	0.4	0.4
Cloud	0.2	0.2
Scintillation	0.3	0.3
Downlink rain loss, dB	0.0	1.6
Rain temp increase, dB	0.0	2.1
Rain + Atmos Loss, dB	0.8	2.2
Rcv. antenna pointing loss, dB	1.0	1.0
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	17.9	17.9
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N, dB	12.2	7.6
Totals		
Uplink C/N (thermal), dB	24.5	24.5
Downlink C/N (thermal), dB	12.2	7.6
x-pol interference, dB	20.0	
•	17.0	20.0
Aggregate C/I from ASI	+	17.0
Aggregate C/I from TX E/S	43.2	43.2
Adjacent Channel C/I, dB	25.0	25.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB Required C/(N+I), dB	10.1 4.7	6.8 4.7
Margin, dB	5.4	2.1

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

	Clear Sky	Rain Up and Rain Dn
Uplink		
Transmit power, dBW	12.2	17.2
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	211.5	211.5
Atmospheric loss, dB	1.0	1.0
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), dB	34.5	34.5
C/I (x-pol, NPR), dB	25.0	25.0
Total Uplink C/(N+I), dB	24.5	24.5
Downlink		
	40.5	40 F
Satellite EIRP, dBW/36 MHz	49.5	49.5
Free space loss, dB	209.3	209.3
Gaseous	0.5	0.5
Cloud Scintillation	0.7	0.7
	0.9	0.9
Downlink rain loss, dB	0.0	3.3
Rain temp increase, dB	0.0	3.4
Rain + Atmos Loss, dB	1.6	4.6
Rcv. antenna pointing loss, dB	1.0	1.0
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	23.2	23.2
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N, dB	14.6	7.2
Totals		
Uplink C/N (thermal), dB	24.5	24.5
Downlink C/N (thermal), dB	14.6	7.2
x-pol interference, dB	20.0	20.0
Aggregate C/I from ASI	14.8	14.8
Aggregate C/I from TX E/S	43.2	43.2
Adjacent Channel C/I, dB	25.0	25.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	10.7	6.2
Required C/(N+I), dB	4.7	4.7
Margin, dB	6.0	1.5

Table A-5. DIRECTV RB-1 Link Budget – Downlink to San Juan, PR

	Clear Sky	Rain Up and Rain Dn
Uplink		
Transmit power, dBW	12.2	17.2
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	211.5	211.5
Atmospheric loss, dB	1.0	1.0
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), dB	34.5	34.5
C/I (x-pol, NPR), dB	25.0	25.0
Total Uplink C/(N+I), dB	24.5	24.5
Downlink		
Satellite EIRP, dBW/36 MHz	58.0	58.0
Free space loss, dB	208.9	208.9
Gaseous	0.2	0.2
Cloud	0.2	0.2
Scintillation	0.3	0.3
Downlink rain loss, dB	0.0	4.9
Rain temp increase, dB	0.0	3.5
Rain + Atmos Loss, dB	0.6	5.3
Rcv. antenna pointing loss, dB	1.0	1.0
Antenna wetting + noise increase, dB	0.0	1.0
Ground G/T, dB/K	17.9	17.9
Bandwidth, dB-Hz	74.8	74.8
Boltzmann's constant, dBW/Hz K	-228.6	-228.6
Total Downlink C/N, dB	19.3	10.0
Totals		
Uplink C/N (thermal), dB	24.5	24.5
Downlink C/N (thermal), dB	19.3	10.0
x-pol interference, dB	20.0	20.0
Aggregate C/I from ASI	18.0	18.0
Aggregate C/I from TX E/S	43.2	43.2
Adjacent Channel C/I, dB	25.0	25.0
Co-frequency C/I, dB	99.0	99.0
Total C/(N+I), dB	13.5	8.8
Required C/(N+I), dB	4.7	4.7
Margin, dB	8.8	4.1