

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of

DIRECTV Enterprises, LLC

Application to Modify Authorization for
SPACEWAY 1 (S2191)

File No. SAT-MOD- _____

**APPLICATION OF DIRECTV ENTERPRISES, LLC
TO MODIFY AUTHORIZATION FOR SPACEWAY 1**

DIRECTV Enterprises, LLC (“DIRECTV”), pursuant to Section 25.117 of the rules of the Federal Communications Commission (“Commission” or “FCC”), 47 C.F.R. § 25.117, hereby seeks to modify its authorization for the SPACEWAY 1 satellite (Call Sign S2191). Specifically, this modification application seeks authority to relocate SPACEWAY 1 from 102.925° W.L. to 138.9° W.L. as early as the first quarter of 2018 and to extend its license term for an additional five years, through December 31, 2025.

In accordance with the Commission’s rules,¹ this application has been filed electronically as an attachment to FCC Form 312. DIRECTV provides the technical information relating to the proposed modification on Schedule S and in the attached Engineering Statement.² The remainder of the technical information on file with the Commission for the SPACEWAY 1 satellite is unchanged and incorporated by reference.³ To the extent necessary, DIRECTV

¹ 47 C.F.R. § 25.117(c).

² 47 C.F.R. § 25.114.

³ See File Nos. SAT-MOD-20091009-00108, SAT-MOD-20070626-00087, SAT-MOD-20041122-00211, SAT-MOD-20040614-00114.

requests that previously granted technical waivers continue to apply to operation of SPACEWAY 1 at 138.9° W.L.⁴

I. PROPOSED MODIFICATIONS

A. Relocation to 138.9° W.L.

DIRECTV requests authority to relocate SPACEWAY 1 to, and operate the satellite at, 138.9° W.L. SPACEWAY 1 is a Ka-band satellite operating in the 18.3-18.8/19.7-20.2 GHz (space-to-Earth) and 28.35-28.6/29.25-30.0 GHz (Earth-to-space) frequency bands. Upon receipt of Commission approval, DIRECTV expects to begin drifting SPACEWAY 1 to 138.9° W.L. as early as the first quarter of 2018. The drift is expected to take approximately 60 days.

During the drift of SPACEWAY 1, DIRECTV will utilize only the satellite’s telemetry, tracking, and command (“TT&C”) frequencies and will follow industry practices for coordinating TT&C transmission during the relocation process. SPACEWAY 1’s specific TT&C frequencies are as follows:

Uplink:	Downlink:
29501.3021 MHz	19701.25 MHz
29509.1146 MHz	19702.25 MHz

⁴ In 2004, the Commission granted waivers for SPACEWAY 1 of 47 C.F.R. § 25.210(c) (Capability to Change Transponder Saturation Flux Density) and 47 C.F.R. § 25.210(i) (Cross-Polarization Isolation). *See Spaceway First Modification 103 WL*, File No. SAT-MOD-20040614-00114 (stamp grant Nov. 4, 2004). Due to changes in these Part 25 rules, waivers are no longer required. The Commission also granted DIRECTV a waiver of the requirement to provide certain information in Schedule S. *See id.*

B. Extension of License Term

DIRECTV seeks to extend the license term for the SPACEWAY 1 satellite through December 31, 2025. The SPACEWAY 1 satellite was placed into service on October 20, 2005.⁵ Pursuant to Sections 25.121(a)(1) and (d)(1) of the Commission's rules, the license term for SPACEWAY 1 will expire on October 20, 2020.⁶ This expiration date is well before the expected end of service life of December 31, 2025.⁷ To the extent the satellite's projected end of service life is extended in the future, DIRECTV will seek an additional license term extension.

II. PUBLIC INTEREST SHOWING

Grant of this modification application to relocate and extend the license term of SPACEWAY 1 is in the public interest. SPACEWAY 1 is currently operating at 102.925° W.L.⁸ Relocating the satellite to 138.9° W.L. will allow DIRECTV to serve customers at that location using currently available Ka-band capacity. The Ka-band frequencies at 138.9° W.L. have not been licensed to, or approved for market access by, any other operator.⁹

The proposed relocation of SPACEWAY 1 to 138.9° W.L. will also serve as a Ka-band back-up for the AMC-8/AURORA III ("AMC-8") satellite, which is currently operating in the C-

⁵ See Letter from Counsel for DIRECTV to Marlene H. Dortch, FCC, File No. SAT-MOD-20041122-00211 (Apr. 20, 2006).

⁶ 47 C.F.R. § 25.121(a)(1), (d)(1).

⁷ DIRECTV will notify the Commission consistent with Section 25.280 of the rules when SPACEWAY 1 commences inclined orbit operations.

⁸ See *Policy Branch Information; Actions Taken*, Report No. SAT-00670, File No. SAT-MOD-20091009-00108 (Mar. 5, 2010) (Public Notice).

⁹ See FCC, Approved Space Station List, <https://www.fcc.gov/approved-space-station-list> (last visited September 12, 2017).

band at 139° W.L.¹⁰ AMC-8 is jointly licensed to SES Americom, Inc. and Alascom, Inc. (“AT&T Alaska”), an affiliate of DIRECTV. AT&T Alaska uses AMC-8 to provide telephony services to locations throughout Alaska, including those that cannot be reached by traditional wireline and terrestrial services. AMC-8’s authorization is set to expire in 2020.¹¹ Granting this application will allow DIRECTV to operate SPACEWAY 1 in conjunction with AMC-8.

The relocation of SPACEWAY 1 from 102.925° W.L. will not have an adverse impact on any existing customers. At its current location, the SPACEWAY 1 satellite provides in-orbit backup capacity and DIRECTV will be able to ensure continuity of service with T10 (S2641) at 102.85° W.L., T12 (S2797) at 102.80° W.L., and T15 (S2930) at 102.75° W.L.

Grant of this relocation request will not result in increased risk of harmful interference. As noted above, DIRECTV will operate only at the above-listed TT&C frequencies during the drift and will coordinate its TT&C transmissions with operators of satellites in the drift path. Should any interference occur during the drift, DIRECTV will take all reasonable steps to eliminate such interference. DIRECTV will operate SPACEWAY 1’s communications payload and TT&C frequencies at 138.9° W.L. in conformance with existing coordination agreements and the FCC’s rules governing operations vis-à-vis adjacent locations. DIRECTV will operate SPACEWAY 1 at 138.9° W.L. in accordance with all previously imposed FCC conditions.

Grant of this modification application to extend the license term will serve the public interest by enabling customers to continue receiving service from SPACEWAY 1. Extending the

¹⁰ See *Policy Branch Information; Actions Taken*, Report No. SAT-01143, SAT-MOD-20151222-00086 (Mar. 18, 2016) (Public Notice).

¹¹ AMC-8’s authorization is set to expire on June 30, 2020. See *Policy Branch Information; Actions Taken*, Report No. SAT-01143, SAT-MOD-20151222-00086 (Mar. 18, 2016) (Public Notice).

license term will also promote the continued efficient use of orbital resources and is consistent with recent decisions by the Commission to extend satellite license terms.¹² There are no single points of failure on SPACEWAY 1 that would result in an inability to de-orbit the satellite. Additionally, the satellite's TT&C functions are operating nominally. DIRECTV intends to dispose of the spacecraft in accordance with the attached Orbital Debris Mitigation Plan.

III. REQUEST FOR WAIVERS

DIRECTV requests waivers, to the extent necessary, of the Commission's bond¹³ and fuel venting¹⁴ requirements. Under Section 1.3 of the Commission's rules, the Commission has authority to waive its rules "for good cause shown."¹⁵ Good cause exists if "special circumstances warrant a deviation from the general rule and such deviation will serve the public interest" better than adherence to the general rule.¹⁶ In determining whether waiver is appropriate, the Commission should "take into account considerations of hardship, equity, or more effective implementation of overall policy."¹⁷ As shown below, there is good cause for the requested waivers, if they are needed.

¹² See, e.g., *Policy Branch Information; Actions Taken*, Report No. SAT-01156, File No. SAT-MOD-20160219-00019 (May 6, 2016) (Public Notice) (granting license extension for Intelsat 1R, a station-kept satellite, based on the satellite's current projected end of service including future inclination).

¹³ 47 C.F.R. §§ 25.164(a), 25.165.

¹⁴ 47 C.F.R. §§ 25.114(d)(14)(ii), 25.283(c).

¹⁵ 47 C.F.R. § 1.3; see also *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

¹⁶ *Ne. Cellular Tel. Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990).

¹⁷ *WAIT Radio*, 418 F.2d at 1159.

A. Milestones and Bond – Sections 25.164(a) and 25.165

Because SPACEWAY 1 is already in-orbit and operating, grant of authority to operate SPACEWAY 1 at 138.9° W.L. is not subject to milestone conditions, and DIRECTV is not required to post a bond.¹⁸ As such, DIRECTV believes that waiver of Section 25.164(a) and 25.165 of the Commission’s rules is not necessary.

To the extent necessary, however, DIRECTV requests waiver of Sections 25.164(a) and 25.165 of the Commission’s rules for any bond that would be associated with the operation of SPACEWAY 1 in new Ka-band frequencies at 138.9° W.L. In this case, there is no risk of warehousing because the SPACEWAY 1 satellite is already in-orbit and will be able to provide service from the 138.9° W.L. location following its relocation as early as the first quarter of 2018. This is far sooner than the five years that would be allowed to an applicant intending to construct, launch, and operate a new satellite at this location.

B. Fuel Venting – Section 25.283(c)

Section 25.283(c) of the Commission’s rules requires an applicant to vent stored energy at the spacecraft’s end of life.¹⁹ The Commission recently amended Section 25.283(c) to “permit a satellite to maintain *de minimis* propellant or pressurant upon disposal.”²⁰ SPACEWAY 1 is a

¹⁸ See, e.g., *Intelsat License LLC, Modification Application to Redeploy and Operate Intelsat 16 at 58.1° W.L.*, File No. SAT-MOD-20160201-00009, Condition No. 12 (stamp grant May 18, 2016) (“Because Intelsat 16 is already in-orbit and operating, grant of authority to operate Intelsat 16 at 58.1° W.L. is not subject to milestone conditions and Intelsat is not required to post a bond. As such, waiver of Sections 25.164(a) and 25.165 of the Commission’s rules is not necessary.”).

¹⁹ 47 C.F.R. §§ 25.283(c) and 25.114(d)(14)(ii) (related disclosure provision on fuel venting).

²⁰ *In the Matter of Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713, ¶ 359 (2015).

Boeing 702 spacecraft that is not designed to vent the pressurant used during orbit raising, which was permanently isolated from the propulsion system by firing a pyrotechnic valve at beginning of in-orbit life. Information regarding the approximate amount of residual helium and xenon gas that cannot be vented at the end of operational life is as follows:

Tank	Volume (M ³)	Pressure (KPA)	Temp (c)	Mass (KG)
HE1	0.1372	1707.8	21.1	0.5096
HE2	0.1372	1707.8	21.1	0.5096
XE1	0.0688	1712	21.1	5.05
XE2	0.0688	1712	21.1	5.05

DIRECTV believes that this residual pressurant on the SPACEWAY 1 satellite complies with the FCC's revised fuel venting requirement.

To the extent necessary, however, DIRECTV requests waiver of Section 25.283(c).

Waiver is appropriate here because grant would not undermine the purpose of these rules, which is to reduce the risk of accidental explosion and post de-orbit debris. As explained in the attached Engineering Statement, DIRECTV will ensure that all active units on SPACEWAY 1 are turned off and that all propellant tanks are depleted. In addition, the satellite's manufacturer, Boeing, has designed SPACEWAY 1 so that risk of accidental explosion causing additional orbital debris is minimal. First, the risk of accidental explosions is minimized because the pressures will be very low at end of life of the satellite, especially after the spacecraft is powered down and the temperature in the tank drops. Additionally, Boeing has designed the tanks so that they leak before they burst. If a leak were to occur, there would not be sufficient energy in the gas stream to damage structurally the spacecraft and generate debris. Moreover, a leak would not significantly perturb the satellite's orbit because the expulsion of the pressurant gas would cause the spacecraft to tumble, and the change in the spacecraft's velocity (*i.e.*, the thrust) would

be randomly distributed, with the resulting impact on the satellite orbit's apogee and perigee being very small.

Grant of the waiver is also supported on hardship grounds. SPACEWAY 1 is an in-orbit spacecraft that commenced service on October 20, 2005. As such the satellite was in a late stage of construction at the time the FCC first adopted a fuel venting requirement and a design change could not be accomplished prior to launch.²¹ Moreover, compliance now would require direct retrieval of the satellite, which is not currently possible.²² Under these circumstances, good cause exists if necessary to waive Section 25.283(c).

IV. ITU COST RECOVERY

DIRECTV is aware that processing fees are currently charged by the International Telecommunication Union ("ITU") for satellite filings, and that Commission applicants are responsible for any and all fees charged by the ITU.²³ DIRECTV is aware of and unconditionally accepts this requirement and responsibility to pay any ITU cost recovery fees associated with the ITU filings that the Commission makes on behalf of DIRECTV for the satellite relocation proposed in this application.

²¹ *Modification Application to Relocate Horizons 2 from 74.0 to 74.05 W.L.*, SAT-MOD-20070628-00090 (stamp grant with conditions Nov. 30, 2007) (waiving Section 25.283(c) when modification of a satellite would present an undue hardship given the late stage of satellite construction at the time the rule was adopted).

²² *Intelsat License LLC, Application to Modify Authorization for Galaxy 3C*, File Nos. SAT-MOD-20170523-00077 and SAT-AMD-20170613-00089 (stamp grant with conditions July 20, 2017) (waiving Section 25.283(c) for a satellite launched prior to adoption of the rule and noting that "compliance would require direct retrieval of the satellite, which is not currently possible").

²³ *See Implementation of ITU Cost Recovery Charges for Satellite Network Filings*, Public Notice, 16 FCC Rcd 18732 (2001).

V. **CONCLUSION**

For the reasons set forth above, DIRECTV respectfully requests that the Commission grant this modification application to relocate and extend the license term for SPACEWAY 1.

DIRECTV Enterprises, LLC

By: */s/ Jack Wengryniuk*

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ENGINEERING STATEMENT

1.0 Overall Description (§ 25.114(d)(1))

This technical appendix is submitted in support of the modification application of DIRECTV seeking authority to relocate the SPACEWAY 1 satellite from 102.925° W.L. to 138.9° W.L. DIRECTV provides here the technical information for the proposed modification at 138.9° W.L. that differs from that already provided relating to current operation of SPACEWAY 1. The remainder of the technical information already on file with the Commission for the SPACEWAY 1 satellite is incorporated by reference.¹ The SPACEWAY 1 satellite will provide service primarily to the state of Alaska and serve as Ka-band backup capacity for the C-band capacity currently used by AT&T Alaska.

2.0 Schedule S (§ 25.114(c))

A Schedule S database detailing the information that will change from the current authorization as a consequence of SPACEWAY 1 operations at the new location is included with this application.² As was highlighted under the current authorization, SPACEWAY 1 has a very large number of identical receive spot beams that operate in the 29.25-29.5 GHz band, and a 1500 element transmit phased array antenna that operates in the 19.7-20.2 GHz band. Only a small subset of the SPACEWAY 1 receive beams will be used at the 138.9° W.L. location and individual gxts for each of these beams is included in the accompanying Schedule S. For the

¹ See File Nos. SAT-MOD-20091009-00108, SAT-MOD-20070626-00087, SAT-MOD-20041122-00211, SAT-MOD-20040614-00114.

² Note that certain data elements that are not changing as part of this modification application have been included in the Schedule S in order to successfully validate the form. Specifically, the limited data in the “Receive Channels” and “Transmit Channels” portion of the Schedule S was taken from the existing Schedule S. This data is not changing as part of this modification request.

19.7-20.2 GHz downlink band, the transmit phased array will be configured to generate a specific set of beams and gxts for that specific set are included in the accompanying Schedule S. In addition, for the 28.35-28.6 GHz receive band, the current authorization includes receive beams, and gxts for those receive beams at the applied-for location have also been included. For the 18.3-18.8 GHz downlink band the current authorization includes a wide area beam. The gxt for this beam from the applied-for location has been included with this application.

In accordance with § 25.114(c)(5)(i), (iii), (iv) and (v): the requested orbital location is 138.9° W.L. Note that this location is 0.1° away from AMC-8 at 139.0° W.L., so there will be no overlap of station-keeping volumes for SPACEWAY 1 with AMC-8. The east-west and north-south station-keeping ranges for SPACEWAY 1 will be $\pm 0.05^\circ$. The antenna axis attitude will be maintained to within 0.1° throughout all operations.

3. Orbital Debris Mitigation (§ 25.114(d)(14))

Spacecraft Hardware Design

DIRECTV has assessed and limited the amount of debris released in a planned manner during normal operations. SPACEWAY 1 will not be a source of debris during 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 SPACEWAY 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 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.

Minimizing the Chance of Accidental Explosions

DIRECTV 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 are 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 SPACEWAY 1 reaches its final disposal orbit, on-board sources of stored energy will be depleted or safely secured, 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 SPACEWAY 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 138.9° W.L. orbital location it

has requested. In addition, to address non-U.S. licensed systems, DIRECTV has reviewed the list of satellite networks in the vicinity of 138.9° 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 the applied-for location have been taken into account in this review.

As a consequence of this review, it has been determined that only one other system has been licensed by the Commission for, and is currently operating within 0.2° of, the requested location for SPACEWAY-1, that being the AMC-8/Aurora III satellite at 139.0° W.L. used by SES and AT&T Alaska. As noted above, the applied-for location is slightly offset from 139.0° W.L. such that there will be no overlap of the station-keeping volumes of SPACEWAY 1 with the AMC-8/Aurora III satellite.

With regard to ITU filings within ± 0.2 degrees of the applied-for location for SPACEWAY 1, the only satellite network for which the ITU has published any information is F-SAT-N4-139W, for which a coordination request was published in BR IFIC 2794 on May 12, 2015. DIRECTV can find no evidence that satellite construction contracts have been awarded for this network, nor does the most recently available Federal Aviation Administration Commercial Space Station Report show any pending satellite launch for this network.

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 SPACEWAY 1 into a disposal orbit with an altitude no less than that calculated using the IADC formula:

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

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 SPACEWAY 1 satellite are:

$$C_R = 1.25$$

$$A = 96 \text{ m}^2$$

$$m = 3679 \text{ kg}$$

Inserting these values into the equation yields the following results:

$$36,021 \text{ km} + (1000 * 1.25 * (96/3679)) = 36053.6 \text{ km}$$

Since geostationary altitude is generally considered to be 35,786 km,³ this yields a desired disposal orbit of at least 267.6 km above the geostationary arc. DIRECTV intends to boost SPACEWAY 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 3.94 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.

³ See *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567, 11593 ¶ 65 (2004).

FCC Form 312, Response to Question 40
Officers, Directors, and Ten Percent or Greater Shareholders

DIRECTV Enterprises, LLC, a Delaware limited liability company, is wholly owned by DIRECTV Holdings, LLC. DIRECTV Holdings, LLC, a Delaware limited liability company, is wholly owned by The DIRECTV Group, Inc., a Delaware corporation. The DIRECTV Group, Inc. is wholly owned by DIRECTV Group Holdings, LLC, a Delaware limited liability company. The address for all of these entities is 2260 E. Imperial Highway, El Segundo, California 90245.

DIRECTV Group Holdings, LLC is a wholly owned subsidiary of AT&T Inc., a Delaware corporation. AT&T Inc. is a publicly traded company, and there is no one person or group that owns 10% or more of the stock of AT&T Inc. The address for AT&T Inc. is 208 S. Akard Street, Dallas, Texas 75202.

The following individuals are officers of DIRECTV Enterprises, LLC:

John T. Stankey	President and Chief Executive Officer
Brian Paperny	Vice President - Tax
Julianne K. Galloway	Treasurer
Brian M. Regan	Secretary
Sherri L. Bazan	Assistant Treasurer
Teresa Blizzard	Assistant Secretary - Tax
Karen M. Diorio	Assistant Secretary - Tax
Linda A. Fisher	Assistant Secretary - Tax
Gary E. Johnson	Assistant Treasurer - Tax
Elaine Lou	Assistant Treasurer
Stacy W. Roth	Assistant Treasurer
Steven Shashack	Assistant Treasurer - Tax
Paul M. Wilson	Assistant Secretary
Jason Bunch	Executive Director - Payroll
Deirdre Scott	Director - Payroll

Each officer is a U.S. citizen and can be contacted at the following address: DIRECTV Enterprises, LLC, 2260 E. Imperial Highway, El Segundo, CA 90245.