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SAT-MOD-20100329-00058

File # SAT-AMD-20100610-00127

Call Sign S2740 Grant Date 06/25/14  
(or other identifier)

Term Dates  
From 06/25/14 To: \_\_\_\_\_

Approved: \_\_\_\_\_

*Stephen J Duall*  
Stephen J Duall  
Chief, Satellite Policy Branch



\*waiver of Sections  
25.283(c) + 25.114(d)(14)(ii)

7 August 2013

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12th Street, SW  
Washington, D.C. 20554

**Re: Call Sign S2740, IBFS File Nos. SAT-MOD-20100329-00058,  
SAT-AMD-20100610-00127**

Dear Ms. Dortch:

DISH Operating L.L.C. files this letter to renew its request for a partial waiver of Sections 25.283(c) and 25.114(d)(14)(ii) of the Commission's rules with respect to the helium tanks on the EchoStar 7 satellite. These rules require all sources of stored energy on board a satellite to be discharged or fully vented at end of life.<sup>1</sup> On October 12, 2012 the Commission dismissed an earlier DISH waiver request with respect to the helium tanks without prejudice, stating that the Commission possessed insufficient information about the helium tanks to make a determination as to whether a waiver was warranted.<sup>2</sup> In subsequent conversations, Commission

<sup>1</sup> 47 C.F.R. § 25.283(c) (requiring "all stored energy sources on board the satellite" to be "discharged, by venting excess propellant, discharging batteries, relieving pressure vessels, and other appropriate measures" at the satellite's end of life); *id.* § 25.114(d)(14)(ii) (requiring space station applicants to demonstrate how stored energy will be removed at the spacecraft end of life).

<sup>2</sup> Application to Modify the License for EchoStar 7 to Specify Operations at the 118.8° W.L. Orbital Location, *Memorandum Opinion and Order*, 27 FCC Rcd. 13123 ¶ 10 (2012) ("EchoStar 7 Modification Order"). DISH initially asked for the waiver on June 10, 2010. DISH Operating L.L.C., Amendment to Application for Minor Modification of Authority to Allow Operation of EchoStar 7 at 118.8° W.L., IBFS File No. SAT-AMD-20100610-00127 (June 10, 2010) ("EchoStar 7 Amendment and Waiver Request"). DISH responded to a Commission request for further information related to its waiver request on September 28, 2012. Letter from Pantelis Michalopoulos, Counsel for DISH Operating L.L.C., to Marlene H. Dortch, Secretary, FCC (Sept. 28, 2012) ("DISH Response Letter") (responding to Letter from Robert G. Nelson, Chief, Satellite Division, International Bureau, FCC, to Pantelis Michalopoulos, Counsel for DISH Operating L.L.C. (Sept. 13, 2012)).

DISH Operating LLC  
IBFS File No. SAT-MOD-20100329-00058  
and SAT-AMD-20100610-00127  
Call Sign S2740

DISH Operating LLC's request for a waiver of Sections 25.283(c) and 25.114(d)(14)(ii) of the Commission's rules, 47 C.F.R. § 25.283(c), 25.114(d)(14)(ii) is GRANTED. Sections 25.283(c) and 25.114(d)(14)(ii) require an applicant to demonstrate that all stored energy will be removed at the spacecraft's end-of-life. EchoStar 7 is a Lockheed Martin A2100 AX spacecraft that was launched on February 21, 2002. DISH states that due to its design, EchoStar 7's two identical helium tanks will not be vented to depletion at the spacecraft's end-of-life.<sup>1</sup> DISH states that prior to end-of-life maneuvers, some of the helium contained in those tanks will be used to repressurize the hydrazine tanks through a latch valve and a pressure regulator. After the hydrazine tanks are repressurized, DISH states that the helium tanks will be isolated from the rest of the spacecraft using a latch valve, pursuant to the spacecraft manufacturer's recommendations. DISH states that the total mass of remaining helium in the two interconnected helium tanks will be approximately 0.558 kilograms at end of life, with each tank volume being approximately 135.2 liters. We grant the requested waivers because EchoStar 7 was launched before Section 25.283(c) became effective and compliance would require direct retrieval of the space craft, which is not currently possible. In making this determination, however, we note that the information DISH submitted for its waiver is not sufficient to support a finding that the intent of the rule would be satisfied by the described procedure for sealing the helium pressurant tanks.


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Approved: Stephen J. Duall  
Stephen J. Duall  
Chief, Satellite Policy Branch

  
**GRANTED\***  
International Bureau

\*waiver of Sections  
25.283(c) + 25.114(d)(14)(ii)

<sup>1</sup> The EchoStar 7 space craft has two oxidizer tanks and two helium tanks. DISH was granted a waiver of Section 25.283(c) with respect to the oxidizer tanks. *DISH Operating LLC*, Memorandum Opinion and Order, 27 FCC Rcd 13123 (Sat. Div., Int'l Bur. 2012).

staff asked DISH specifically to explain: 1) the origins of the reported pressure, temperature, and mass numbers for the residual helium left in the helium tanks at the satellite's end of life, and 2) the reason why this residual helium could not be vented. DISH answers these questions, below, in support of its renewed waiver request.

**1. Origin of the Figures.** In its September 28, 2012 letter, DISH reported the following information about the helium tanks on the EchoStar 7 satellite:<sup>3</sup>

<i>Tank</i>	<i>Volume (in<sup>3</sup>)<sup>4</sup></i>	<i>He (kg), End of Life</i>	<i>Internal T<sub>max</sub> (C), Disposal Orbit</i>	<i>Internal P<sub>max</sub> (psia), Disposal Orbit<sup>5</sup></i>
He Tank 1	4,234.8	0.558 (between the 2 tanks)	35°	500
He Tank 2	4,234.8		35°	500

DISH offers further explanation of these figures as follows:

- The 0.558 kg of helium was calculated using the spacecraft manufacturer's estimate of the mass of helium remaining in the tanks following the first repressurization of the hydrazine tanks in August 2010 coupled with an estimate of the mass of helium required to bring the hydrazine and helium tanks into equilibrium during the final repressurization of the hydrazine tank prior to end-of-life maneuvers.
- The 35 degrees Celsius maximum internal temperature for the helium tanks in the disposal orbit is taken from the spacecraft manufacturer's prediction of the worst case temperature for the spacecraft in this orbit.
- The 500 pounds per square inch area ("psia") maximum internal pressure for the helium tanks in the disposal orbit is also taken from the spacecraft manufacturer's operations manual for the satellite; the pressure was not calculated using the figures contained in the above table. Notably, DISH estimates that the average pressure in the tanks will be well below the maximum estimated by the manufacturer. Specifically, calculations using the ideal gas law, an average temperature of 15° Celsius, and the above-referenced helium mass and tank volumes produce an estimated average pressure for the helium tanks of approximately 358 psia.

**2. Reason why the Residual Helium Cannot Be Vented.** Prior to end-of-life maneuvers, the helium will be used to repressurize the hydrazine tank. Once the pressure in the

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<sup>3</sup> DISH Response Letter at 2.

<sup>4</sup> Equivalent to 0.1352 cubic meters.

<sup>5</sup> This maximum pressure is well below the burst pressure for the Helium tanks. The spacecraft manufacturer's documentation for the satellite states that "The maximum expected operating pressure (MEOP) of each pressurant tank is 4500 psia with a 1.5:1 burst factor of safety."

hydrazine tank is in equilibrium with the pressure in the helium tanks, no further helium can migrate from the helium tanks to the hydrazine tank, and the helium tanks will be isolated from the rest of the spacecraft via latch valve in accordance with the spacecraft manufacturer's recommendation. There is no manufacturer recommended mechanism to vent the residual helium from the helium tanks themselves after the final repressurization of the hydrazine tank.

The Commission may waive its rules for "good cause shown," including in cases where compliance would impose an undue hardship and the policy underlying the rule will still be served.<sup>6</sup> These circumstances are met here. First, of course, EchoStar 7 is incapable of alteration at this stage. It was designed and launched before the adoption of the Commission's current orbital debris mitigation rules. The Commission is well aware of the limitations of the Lockheed Martin A2100 spacecraft.<sup>7</sup> The bus design makes it impossible to vent the residual helium at the satellite's end of life. At the same time, it is extremely unlikely that the helium tanks will leak or burst. This means that the chance of accidental explosions has been minimized, consistent with the purpose of Sections 25.283(c) and 25.114(d)(14)(ii) of the Commission's rules.<sup>8</sup> For these reasons, the Commission has repeatedly granted waivers of Sections 25.283(c) and 25.114(d)(14)(ii) of the Commission's rules for satellites based on the A2100 bus.<sup>9</sup>

Based upon the foregoing, the Commission should grant the requested waiver.

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<sup>6</sup> See 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969); see also Stamp Grant, IBFS File No. SAT-STA-20080219-00048, SAT-STA-20080229-00054 (Mar. 12, 2008) (explaining that "waiver is granted because modification of the [Lockheed Martin A2100] spacecraft would present an undue hardship, given the late stage of satellite construction.").

<sup>7</sup> See *infra* note 9.

<sup>8</sup> See 47 C.F.R. § 25.114(d)(14)(ii) (addressing the discharge of energy sources in the context of requiring satellite operators to assess and limit "the probability of accidental explosions during and after completion of mission operations"); *WAIT Radio*, 418 F.2d at 1157 (noting that a waiver may be granted when it would not undermine the purpose of the rule); *Intelsat North America LLC*, 22 FCC Rcd. 11989 ¶ 6 (2007).

<sup>9</sup> Stamp Grants, SES Americom, Inc., File No. SAT-MOD-20121224-00221, Call Sign S2181, at condition 5 (Mar. 22, 2013); SES Americom, Inc., File No. SAT-MOD-20111220-00243, Call Sign S2162, at condition 7 (June 28, 2012); Intelsat License LLC, File No. SAT-RPL-20120216-00018, Call Sign S2854, at condition 4 (May 25, 2012); New Skies Satellites B.V., File No. SAT-MPL-20120215-00017, Call Sign S2463, at condition 7 (May 25, 2012); SES Americom, Inc., File No. SAT-MOD-20110718-00130, Call Sign S2445, at condition 2 (Oct. 13, 2011); EchoStar Satellite Operating Corp., File No. SAT-LOA-20071221-00183, at condition 4 (Mar. 12, 2008).



**CERTIFICATION OF PERSON RESPONSIBLE  
FOR ENGINEERING INFORMATION**

I hereby certify that I am the technically qualified person responsible for preparation or review of the engineering information contained in the foregoing letter, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information in the foregoing letter, and that it is complete and accurate to the best of my knowledge and belief.

/s/

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18 October 2013

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12th Street, SW  
Washington, D.C. 20554

**Re: Call Sign S2740, IBFS File Nos. SAT-MOD-20100329-00058,  
SAT-AMD-20100610-00127**

Dear Ms. Dortch:

DISH Operating L.L.C. (“DISH”) files this letter to supplement information related to its request for a partial waiver of Sections 25.283(c) and 25.114(d)(14)(ii) of the Commission’s rules for the helium tanks on the EchoStar 7 satellite.<sup>1</sup> In DISH’s renewed request for a waiver, DISH noted that “[p]rior to end-of-life maneuvers, the helium will be used to repressurize the hydrazine tank. Once the pressure in the hydrazine tank is in equilibrium with the pressure in the helium tanks, no further helium can migrate from the helium tanks to the hydrazine tank, and the helium tanks will be isolated from the rest of the spacecraft via latch valve in accordance with the spacecraft manufacturer’s recommendation.”<sup>2</sup>

This repressurization is initiated by opening the latch valve between the helium and hydrazine tanks. The flow of helium from the helium tanks to the hydrazine tank is controlled by a pressure regulator. The flow of helium can be further controlled by closing the latch valve at

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<sup>1</sup> 47 C.F.R. § 25.283(c) (requiring “all stored energy sources on board the satellite” to be “discharged, by venting excess propellant, discharging batteries, relieving pressure vessels, and other appropriate measures” at the satellite’s end-of-life); *id.* § 25.114(d)(14)(ii) (requiring satellite authorization applicants to demonstrate how stored energy will be removed at the spacecraft end-of-life).

<sup>2</sup> Letter from Stephanie A. Roy, Counsel for DISH Operating L.L.C., to Marlene H. Dortch, Secretary, FCC, IBFS File Nos. SAT-MOD-20100329-00058, SAT-AMD-20100610-00127 (Aug. 9, 2013).

