

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

In the Matter of Request of	)	
	)	
XM RADIO LLC	)	Call Sign S2616
	)	
For Special Temporary Authority to	)	
Further Extend the XM-4 License Term and	)	
Approve Updated Orbital Debris Mitigation Plan	)	

REQUEST FOR SPECIAL TEMPORARY AUTHORITY

XM Radio LLC (“XM Radio”) respectfully requests a 180-day extension through December 10, 2023, of the special temporary authority (“STA”) granted in File No. SAT-STA-202221013-00135,¹ which extended the XM-4 license term and authorized relocating the satellite to 39° W.L. +/- 0.1 degrees in preparation for orbit raising. In addition, XM Radio seeks authority to remove XM-4 to a disposal orbit pursuant to an updated orbital debris mitigation plan that reflects a higher level of residual xenon. Grant of the requested authority will serve the public interest by facilitating the orderly retirement of XM-4.

Background

The XM-4 STA extended the license term for XM-4 past its prior December 15, 2022, expiration date and authorized XM Radio to perform telemetry, tracking and command (“TT&C”) to relocate the spacecraft to 39° W.L. and maintain the satellite there to prepare it for retirement. XM Radio completed this drift in early March and started venting the satellite’s fuel tanks. Venting the spacecraft’s bi-propellant is expected to be the most time-consuming aspect of the retirement process, and XM Radio currently estimates that it could take until December

¹ See *XM Radio Inc.*, File No. SAT-STA-202221013-00135 (“XM-4 STA Request”), granted Dec. 15, 2022 (“XM-4 STA”).

2023 to complete. XM Radio accordingly seeks extension of the XM-4 STA, which runs through June 13, 2023, to maintain XM-4 at 39° W.L. +/- 0.1 degrees and continue venting its excess fuel.

XM Radio also requests approval of an updated orbital debris mitigation plan for the satellite. As XM Radio has explained, it has worked with XM-4's manufacturer, Boeing Satellite Systems, Inc. ("Boeing"), to develop a plan to retire the spacecraft, taking into account the experience gained in retiring XM-1 and XM-2, the first Boeing 702 spacecraft to be removed to a disposal orbit.² Like these earlier Boeing 702 satellites, XM-4 has both an electric xenon ion propulsion system ("XIPS") used for on-station propulsion and a traditional liquid bi-propellant system that was used for initial orbit raising following the satellite launch.³ XM-4 also has a backup propulsion system that was not present on XM-1 and XM-2, and in order to support that backup system, XM-4 also has larger fuel and oxidizer tanks than XM-1 and XM-2 and three years' worth of additional propellant loaded in the tanks that was not used.⁴ These factors prolong the time needed to vent the tanks.

XM Radio still intends to raise XM-4's orbit at least 349 km above the geostationary arc, the altitude XM Radio calculated using the IADC standard, as set forth in the orbital debris mitigation plan the Commission previously approved for the spacecraft.⁵ The only changes proposed to that plan concern the residual xenon levels expected to be onboard the satellite at its

² XM-4 STA Request, Narrative at 2.

³ *Id.*

⁴ *Id.*

⁵ *See id.* at 3 & n.6.

retirement. As discussed below, the revised plan remains consistent with Commission precedent and the public interest.

Request for Extended Operating Authority

XM Radio requests extension of the XM-4 STA for an additional 180-day period. Extending the XM-4 license authority will allow XM Radio to maintain the spacecraft at 39° W.L. to vent excess propellant and remove the satellite to a disposal orbit. XM Radio is not seeking authority to use XM-4 for communications services during the period of the requested extension but only to continue TT&C operations to control the satellite and prepare it for orbit-raising maneuvers.⁶

Revised Orbital Debris Mitigation Plan

XM Radio seeks Commission authorization to proceed with the retirement of XM-4 pursuant to the updated orbital debris mitigation plan described herein to prevent significant delay in the planned retirement schedule. The updated plan conforms to Commission policies.

XM Radio had previously submitted information provided by Boeing indicating that a small amount of xenon would remain in each of the two xenon tanks onboard XM-4 at end of life.⁷ The Commission granted XM Radio a waiver of the Section 25.283(c) requirements then in effect requiring that operators vent excess propellant and relieve pressure vessels in connection with the residual xenon that XM Radio expected to be on XM-4 at end of life.⁸

⁶ The TT&C frequencies for XM-4 are as follows:
Telemetry frequencies: 2340.2 MHz and 2342.0 MHz
Command frequencies: 7045 MHz and 7072 MHz

⁷ See *XM Radio Inc.*, File No. SAT-MOD-20100722-00165, Technical Appendix at 3-4, granted Oct. 14, 2010 (“XM-4 Modification Grant”).

⁸ See XM-4 Modification Grant, Attachment to Grant at 1-2, ¶ 2.

XM Radio now projects that following use of the XIPS thrusters to vent XM-4's two xenon tanks, the residual pressure in each tank will be between 3.7 and 4.2 MPa. The Commission previously approved this pressure range for the residual xenon on XM-1 and XM-2, determining that waiving the rules was justified given the constraints on venting operations over the long term and the public interest in removing a satellite no longer capable of performing its mission from the geostationary arc.⁹

For the same reasons, approving the revised level of residual xenon for XM-4 is justified. Due to the limited availability of earth stations around the globe that are capable of supporting TT&C for XM-4, XM Radio is unable to continue venting operations over a long period once the satellite begins drifting westward to raise its orbit. As with XM-1 and XM-2, XM-4 is being retired early due to performance issues outside of XM Radio's control, and the shortened useful life of the satellite reduced the amount of xenon used during the satellite's operational lifetime, leading to a higher level of residual xenon at the beginning of the disposal process. To avoid significantly delaying the removal of XM-4 from the geostationary arc, the Commission should approve the updated xenon levels for XM-4.

No change is proposed to the residual pressure levels of other tanks aboard the XM-4 spacecraft. The Commission previously granted a waiver of Section 25.283(c) in connection with the XM-4 helium tanks, which were sealed following the last orbit-raising maneuver during the launch phase of the satellite.¹⁰

⁹ See *XM Radio Inc.*, File No. SAT-STA-20150317-00011, Narrative at 6 (proposing updated orbital debris plan for XM-1 with a xenon tank pressure of 3.7-4.2 MPa), granted Apr. 30, 2015, Attachment at 2 & n.3 (finding that approval of updated orbital debris plan for XM-1 with revised residual xenon values will serve the public interest and noting that the values are consistent with those approved for XM-2).

¹⁰ See XM-4 Modification Grant, Attachment to Grant at 1-2, ¶ 2.

The fuel and oxidizer tanks will also have a limited amount of residual pressure. Specifically, XM Radio anticipates that the two XM-4 tanks containing monomethyl hydrazine (“MMH”) will each have a residual pressure of 0.134 MPa and that the two XM-4 tanks containing nitrogen tetroxide (“MON-3”) will each have a residual pressure of 0.211 MPa. These expected pressures are similar to the levels XM Radio achieved for the MMH and MON-3 tanks on XM-1¹¹ and XM-2 and represent approximately 4% of the tanks’ burst pressure at -20° C. In 2015 the Commission revised Section 25.283(c) to permit satellites to maintain *de minimis* levels of propellant or pressurant upon disposal and cited comments from Boeing indicating that spacecraft designs allowing for a residual pressure of less than 5% of burst pressure are typical.¹² The expected XM-4 MMH and MON-3 tank pressures are consistent with this policy.

Conclusion

For the foregoing reasons, XM Radio respectfully requests special temporary authority for an additional 180-day period commencing on June 13, 2023, to extend the XM-4 license term

¹¹ See Letter of Karis A. Hastings, Counsel to XM Radio, to Marlene H. Dortch, File No. SAT-STA-20151006-00069, Mar. 23, 2016 at 1.

¹² *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd 14713, 14824 & n.827 (2015).

and to allow retirement of the satellite to proceed in accordance with the updated orbital debris mitigation plan discussed herein.

Respectfully submitted,

XM Radio LLC

/s/ Patrick L. Donnelly

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