

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

In the Matter of Request of)
)
XM RADIO LLC) Call Sign S2119
)
For Special Temporary Authority to)
Extend the XM-2 License Term and)
Revise the Orbital Debris Mitigation Plan)

Expedited Action Requested

REQUEST FOR SPECIAL TEMPORARY AUTHORITY

XM Radio LLC (“XM Radio”) respectfully requests special temporary authority (“STA”) for a period of 30 days commencing on September 27, 2014, to extend the license term for the XM-2 space station and permit its removal to a disposal orbit pursuant to a revised 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-2 beginning in October.

XM-2 commenced operations at 115° W.L. on March 31, 2001, with an initial eight-year license term. However, due to performance issues, the satellite was replaced as a primary operational satellite at 115° W.L. in October 2006, when XM Radio launched XM-4.¹ Earlier this year, XM Radio sought and obtained STA to extend the XM-2 license term, which was due to expire on March 31, 2014, and to permit relocation of XM-2 to 27° W.L. with an

¹ When launched, XM-2 had an expected useful life of fifteen years. In late August 2001, Boeing Satellite Systems (“BSS”), the satellite manufacturer, advised XM Radio of a progressive degradation problem with the solar array output power of the first generation BSS 702 class satellites, including XM-2. XM Radio accelerated the replacement of XM-2 in response to this issue.

east-west stationkeeping tolerance of +/- 0.1 degrees in preparation for orbit-raising maneuvers.² Subsequent to grant of the XM-2 STA Request, XM Radio has been taking the planned steps to ready the spacecraft for retirement, drifting the satellite to 27° W.L. and venting excess propellant onboard the spacecraft, which has both a traditional liquid bi-propellant system that was used for initial orbit raising and an electric xenon ion propulsion system (“XIPS”) used for stationkeeping while in orbit.

The XM-2 STA Request did not propose any changes to the approved orbital debris mitigation plan for the spacecraft.³ In that STA application, however, XM Radio emphasized that XM-2 is the first spacecraft in the BSS 702 product line to be removed to a disposal orbit and neither BSS itself nor any other satellite operator had prior experience venting the XIPS systems.⁴ Based on XM Radio’s newly acquired experience with XIPS venting the company has had to revise its plans. Specifically, although venting the bi-propellant system will be complete in mid-October, XM Radio has not been able to deplete the excess xenon on board the spacecraft as quickly as anticipated. As a result, if the orbit-raising maneuvers begin as scheduled on or about October 15, the residual xenon on XM-2 after its retirement would exceed the amounts specified in the Commission-approved orbital debris plan for the spacecraft. XM Radio seeks Commission authorization to proceed with the updated orbital debris mitigation plan set forth herein to permit orbit-raising to commence according to the current schedule.

² See Call Sign S2119, File No. SAT-STA-20140204-00018, (the “XM-2 STA Request”), grant-stamped Mar. 28, 2014.

³ See *id.*, Narrative at 3.

⁴ See *id.*, Narrative at 2.

XM Radio previously submitted information provided by BSS indicating that approximately 2.2 kg (2200 grams) of xenon would remain in each of the two xenon tanks onboard XM-2 at end of life.⁵ Based on this data and given the fact that XM-2 was designed and launched prior to the Commission's adoption of its orbital debris mitigation requirements, the Commission granted XM Radio a waiver of the Section 25.283(c) requirements to vent excess propellant and relieve pressure vessels in connection with the residual xenon expected to be on XM-2 at end of life.⁶ While the pressure in the xenon tanks will be relieved, XM Radio now projects that 18-22 kg of residual xenon will remain in each tank at end of life. As set forth below, approving the revised plan with respect to residual xenon and granting an updated waiver of Section 25.283(c) would be in the public interest in light of the specific facts here.

A number of factors have contributed to the change in the projected end of life xenon levels for XM-2. As a threshold matter, because XM-2 is being retired early due to performance issues outside of XM Radio's control, the amount of xenon used during the satellite's operational lifetime was reduced, leading to a higher level of residual xenon as a starting point. XM Radio had planned to vent the excess xenon while XM-2 was positioned at 27° W.L., but that process has proved to take significantly longer than had been expected.

As noted above, the XIPs system on XM-2 is used for regular stationkeeping maneuvers. This means that after a period of time venting xenon each day, the system must be reconfigured to operate in stationkeeping mode. XM Radio found that the reconfiguration

⁵ See Call Sign S2119, File No. SAT-MOD-20101001-00205, Technical Appendix at 4 (explaining that the xenon tanks are equipped with a regulator that prevents additional gas from being vented once the pressure falls below the set point of the regulator), grant-stamped Nov. 9, 2010.

⁶ See *id.*, Attachment to Grant at 2, ¶ 6.

process was much more complicated and time-consuming than it had anticipated, with the result that the time that could be spent venting the xenon each day was reduced.

Continuing to vent xenon after the satellite is decommissioned is not possible. As XM Radio has explained, reliable ground resources operating with the S- and X-band frequencies used by XM-2 and the tracking capabilities needed to support the orbit-raising maneuvers and decommissioning are extremely limited.⁷ As a result, once the orbit-raising begins, XM Radio will have a restricted window of time before the satellite's westward drift takes it beyond the range of the ground network. The decommissioning process includes sending commands to the satellite to drain the batteries and turn off all active units, and these steps must be taken before the ground antennas lose contact with the satellite. Because opening the valves to the xenon tanks requires power, the valves will close and remain closed once the power to the satellite is terminated.

Maintaining XM-2 at 27° W.L. to vent additional xenon before beginning orbit-raising maneuvers would materially delay the satellite's retirement. Rather than being able to commence the retirement process in mid-October as planned, XM Radio would have to put off the orbit-raising until mid-April of 2015, given the length of time it would take to significantly reduce the xenon levels and the delay required by the spring eclipse season.⁸ Moreover, because uncertainty regarding the amount of xenon remaining in the tanks is higher than was originally forecast, a greater reserve of xenon is needed to ensure the target disposal orbit parameters can

⁷ XM-2 STA Request, Narrative at 2-3.

⁸ These delays would also affect the timetable for XM-1's retirement, which cannot begin until after orbit-raising for XM-2 is completed given the need to use the same limited ground antenna resources.

be achieved. Therefore, even with additional time for venting, XM Radio would be projecting higher residual xenon levels than those specified in its prior orbital debris mitigation plan.

Instead, XM Radio seeks Commission authority to proceed with retirement of XM-2 as currently scheduled starting in mid-October 2014 and requests a waiver of Section 25.283(c) to reflect the increased residual xenon. The additional xenon does not increase the risk of orbital debris. With 18-22 kg of xenon, the pressure in each tank will be 3.7-4.2 MPa assuming a temperature of 20° Celsius. This pressure represents a small fraction (12-14%) of the 30.1 MPa for which the tanks have been proof pressure tested and will drop further as the temperature on the spacecraft decreases following shut-down of its electrical systems. Because the xenon is inert, having the higher levels of residual xenon on board the spacecraft at its end of life will pose no risk of chemical energy release. Furthermore, the tanks are well shielded and will be isolated from any source of electrical energy. XM Radio emphasizes that nothing has changed with respect to XM Radio's plan to raise XM-2 to a disposal orbit at least 313 km above the geostationary arc, which is the altitude derived by application of the IADC standard.⁹

⁹ See File No. SAT-AMD-20080129-00032 (Call Sign S2119), Attachment 1 at 3-4, grant-stamped Feb. 14, 2008.

Under these circumstances, the public interest would be served by permitting retirement of XM-2 to go forward under the current schedule, rather than requiring venting of additional xenon. Accordingly, XM Radio respectfully requests special temporary authority for a period of 30 days commencing on September 27, 2014, to extend the XM-2 license term and to allow retirement of the satellite to proceed in accordance with the updated orbital debris mitigation plan discussed herein.

Respectfully submitted,

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