



File # SAT-STA-20140922-00103

Call Sign S2119 Grant Date 9/26/14

(or other identifier)

Approved by OMB  
3060-0678

From 9/27/14 Term Dates To: +30 days

Approved: [Signature]  
Chief, Satellite Engng

\*With conditions

Date & Time Filed: Sep 22 2014 3:28:21:220PM  
File Number: SAT-STA-20140922-00103  
Callsign:

FEDERAL COMMUNICATIONS COMMISSION  
APPLICATION FOR SPACE STATION SPECIAL TEMPORARY AUTHORITY  
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APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:  
XM-2 (S2119) 30 Day STA Extension and Revised Orbital Debris Plan

1. Applicant

<b>Name:</b>	XM Radio LLC	<b>Phone Number:</b>	202-380-1383
<b>DBA Name:</b>		<b>Fax Number:</b>	202-380-4981
<b>Street:</b>	1221 Avenue of the Americas 36th Floor	<b>E-Mail:</b>	james.blitz@siriusxm.com
<b>City:</b>	New York	<b>State:</b>	NY
<b>Country:</b>	USA	<b>Zipcode:</b>	10020
<b>Attention:</b>	James S Blitz		

**XM Radio LLC**  
**IBFS File No. SAT-STA-20140922-00103**  
**Call Sign S2119**

The application of XM Radio LLC (XM Radio) for special temporary authority, IBFS File No. SAT-STA-20140922-00103, is granted. Specifically, XM Radio is authorized, for a period of 30 days, commencing on September 27, 2014, to continue to conduct Telemetry, Tracking, and Command (TT&C) operations necessary to maintain XM Radio's Satellite Digital Audio Radio Service (SDARS) space station, XM-2, at its current orbital location of 27° W.L. with an east-west stationkeeping tolerance of +/- 0.1 degrees. XM Radio is authorized to conduct such TT&C operations using the following center frequencies: 2339.2 MHz, 2339.7 MHz, 2344.0 MHz, and 2344.5 MHz (space-to-Earth); 7049.0 MHz and 7074.0 MHz (Earth-to-space). Additionally, we grant XM Radio's request to operate beyond the current license term for the XM-2 space station during this 30-day period to allow XM Radio sufficient time to complete its planned maneuvers for XM-2 in preparation for the space station's removal to a disposal orbit.<sup>1</sup> All operations of the XM-2 space station must be in accordance with the technical specifications set forth in its application, XM-2's current authorization, the Commission's rules, and the conditions set forth below.

1. All operations under this grant of special temporary authority must be on an unprotected and non-harmful interference basis, i.e., XM Radio shall not cause harmful interference to, and must not claim protection from interference caused to it by, any other lawfully operating radiocommunication system.
2. In the event of any harmful interference as a result of the operations under this grant of special temporary authority, XM Radio must cease operations immediately upon notification of such interference and shall immediately inform the Commission, in writing, of such an event.
3. XM Radio must coordinate the operations of XM-2 with existing geostationary space stations to ensure that no unacceptable interference results from its operations at the 27° W.L. orbital location.
4. XM Radio must operate only the TT&C frequencies on XM-2 during the space station's operations at the 27° W.L. orbital location.
5. The Commission's previous grant of XM Radio's request for a waiver of Section 25.210(g) of the Commission's rules, 47 C.F.R. § 25.210, to allow operation of XM-2 at 27° W.L. with an east-west stationkeeping tolerance of +/- 0.1 degrees instead of the +/- 0.05 degree tolerance required by the rule will continue to apply for purposes of this special temporary authority. XM Radio was originally granted a waiver of Section 25.210(f) to permit XM-2 to operate with an east-west stationkeeping tolerance of +/- 0.1 degrees at 115.25 W.L. See IBFS File No. SAT-MOD-20101001-00205, grant-stamped Nov. 9, 2010. This waiver for the same reasons as provided for the original grant at 115.25 W.L.


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<sup>1</sup> XM-2's current authorization expired on March 31, 2014. On March 28, 2014, the Commission granted XM Radio's request for special temporary authority to extend XM-2's authorization for a period of 180 days to allow it to perform maneuvers in preparation for XM-2's removal to a disposal orbit. The initial maneuvers drifted the space station east to the 27° W.L. orbital location so that the westward drift of the space station that would occur during the planned orbit-raising maneuver would not take XM-2 out of the range of XM Radio's TT&C earth stations and thus lose control over the space station. See IBFS File No. SAT-STA-20140204-00018, grant-stamped Mar. 28, 2014 (*March STA*), Narrative at 3.

**XM Radio LLC**  
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6. XM Radio's request for a further waiver of Section 25.283(c) to operate XM-2 under a revised orbital debris mitigation plan as outlined in its application is GRANTED. The orbital debris mitigation plan that was approved as part of XM-2's current authorization anticipated that 2.2 kilograms of xenon would remain in each of the two xenon tanks onboard XM-2 at end of life.<sup>2</sup> In the instant application, XM Radio states that if plans proceed to raise XM-2 to a disposal orbit of 313 kilometers above geostationary orbit, the residual xenon remaining in the tanks would increase to 18-22 kg of xenon in each tank. This waiver grant is based upon the following findings:

- a) Telemetry, tracking and command functions for XM-2 are conducted in the 2320-2345 GHz band. Due to geographic limitations on the frequency allocations in this band, its use for TT&C restricts the availability of earth stations to a limited geographic area and prevents conducting venting operations over a long term after the satellite is removed from orbit and begins to drift westward. Such operations, if used to fully vent the xenon tanks, would cover a particularly long period because the quantity of remaining xenon propellant is larger than anticipated due to early termination of the satellite's primary mission, which was caused by component failures unrelated to the propulsion system.
- b) It is in the public interest to remove a satellite from the geostationary orbit when it is no longer capable of performing its primary mission.
- c) There are no other changes to the orbital debris mitigation plan previously approved by the Commission.
7. Any action taken or expense incurred as a result of operations pursuant to this grant of special temporary authority is at XM Radio's own risk.
8. This action is taken on delegated authority pursuant to 47 C.F.R. § 0.261 and is effective upon release. Petitions for reconsideration under 47 C.F.R. § 1.106 or applications for review under 47 C.F.R. § 1.115 may be filed within 30 days of the date of the Public Notice announcing this action.

	
<b>GRANTED</b>	
Federal Communications Commission	
+ International Bureau	
File #	<u>SAT- STA- 20140922- 00103</u>
Call Sign	<u>S 2119</u>
Grant Date	<u>9/26/14</u>
(or other identifier)	
From	<u>9/27/14</u>
To:	<u>+ 30 days</u>
Approved:	<u>Kelly A. Mels</u>
	<u>Chief Satellite Ops</u>

*with conditions*

<sup>2</sup> See IBFS File No. SAT-MOD-20101001-00205, grant-stamped Nov. 9, 2010.

2. Contact	
<b>Name:</b>	Karis A. Hastings
<b>Company:</b>	SatCom Law LLC
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<b>Fax Number:</b>	
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<b>State:</b>	DC
<b>Zipcode:</b>	20004 -
<b>Relationship:</b>	Legal Counsel
(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)	
3. Reference File Number SATSTA2014020400018 or Submission ID	
4a. Is a fee submitted with this application?	
<input checked="" type="radio"/> If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114). <input type="radio"/> Governmental Entity <input type="radio"/> Noncommercial educational licensee <input type="radio"/> Other (please explain):	
4b. Fee Classification    CRY – Space Station (Geostationary)	
5. Type Request	
<input type="radio"/> Change Station Location <input checked="" type="radio"/> Extend Expiration Date <input type="radio"/> Other	
6. Temporary Orbit Location	7. Requested Extended Expiration Date 2014-10-27 00:00:00.0

8. Description (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

XM Radio LLC requests special temporary authority 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.

9. By checking Yes, the undersigned certifies that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.  Yes  No

10. Name of Person Signing  
James S. Blitz

11. Title of Person Signing  
Vice President, Regulatory Counsel

12. Please supply any need attachments.

Attachment 1: STA Narrative

Attachment 2:

Attachment 3:

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT  
(U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION  
(U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

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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.<sup>1</sup> 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

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<sup>1</sup> 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.<sup>2</sup> 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.<sup>3</sup> 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.<sup>4</sup> 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.

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

<sup>3</sup> See *id.*, Narrative at 3.

<sup>4</sup> 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.<sup>5</sup> 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.<sup>6</sup> 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

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<sup>5</sup> 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.

<sup>6</sup> 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.<sup>7</sup> 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.<sup>8</sup> 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

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<sup>7</sup> XM-2 STA Request, Narrative at 2-3.

<sup>8</sup> 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.<sup>9</sup>

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<sup>9</sup> See File No. SAT-AMMD-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,

XM Radio LLC

/s/ James S. Blitz

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Dated: September 22, 2014

**Technical Certification**

I, Bridget Neville, Vice President and General Manager for Satellite Engineering and Operations of Sirius XM Radio Inc., hereby certify under penalty of perjury that:

I am the technically qualified person with overall responsibility for preparation of the technical information contained in the foregoing STA request. I am familiar with the technical requirements of Part 25 of the Commission's rules, and the information contained in the request is complete and accurate to the best of my knowledge, information and belief.

/s/  

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Bridget Neville

Dated: September 22, 2014