

## Exhibit 1

### **Nature of the Proposed Research and Experimentation**

Sirius XM Radio Inc. (“SiriusXM”) seeks a conventional experimental radio license pursuant to Section 5.54(a)(1) of the Commission’s rules, including authority to conduct a product development trial under the parameters specified below.<sup>1</sup> The requested license will permit SiriusXM to research, experiment with, and test the feasibility of a new low power terrestrial repeater (the “Spot Repeater”) that is in the conceptual, developmental, and design stage. SiriusXM hopes that such research and experimentation will assist SiriusXM in developing a repeater that will mitigate mobile cellular network interference to SiriusXM satellite radio subscribers.

SiriusXM provides digital audio programming services to over 30 million subscribers. These subscribers rely on the SiriusXM service not only for unique and diverse content, but also for important public safety-related information, news, and emergency alerts. Sirius XM is the holder of Satellite Digital Audio Radio Service (“SDARS”) spectrum used to provide the service.

As the Commission is aware, SiriusXM subscribers have been experiencing harmful interference to their reception in major markets.<sup>2</sup> The interference is occurring in the vicinity of certain Advanced Wireless Services (“AWS”) base stations. Testing by SiriusXM and an independent engineering consultant has demonstrated that the operation of these AWS base stations in combination with Personal Communications Service (“PCS”) stations is creating intermodulation interference to SDARS receivers, resulting in muting that prevents the reception of satellite radio signals in the vicinity of these AWS stations. SiriusXM expects the volume of interference will continue to increase and spread across multiple markets as wireless carriers build out their LTE networks nationwide.

In recent months, SiriusXM has made significant progress in working together with wireless carriers to better understand and resolve the interference to SDARS radio receivers and SiriusXM is optimistic this progress will continue. The wireless carriers have taken some helpful steps to mitigate the intermodulation interference caused by their operations by making technical modifications to certain base stations. SiriusXM believes base station modifications are a necessary and appropriate method for remediating the interference; however, wireless carriers are

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<sup>1</sup> As discussed herein, this application seeks authority to experiment with spot repeaters that will supplement the terrestrial repeater network serving SiriusXM subscribers. The use of these repeaters will be transparent to subscribers and the repeaters will not be marketed, sold or leased to any party. Indeed, as SiriusXM is the sole holder of SDARS spectrum, no other party would have use for this equipment. The SiriusXM service provided to subscribers is not dependent upon use of these repeaters, and such services will continue without interruption when the trial is concluded, even if the new repeater design is not permanently authorized and the use is discontinued. Therefore, this request is categorized as a product development trial pursuant to Section 5.601 of the Commission’s rules. Furthermore, there are no “participants” within the meaning of Section 5.601(b) that need to be informed of the experiment.

<sup>2</sup> See, e.g., *Applications of Cellco Partnership d/b/a Verizon Wireless and T-Mobile License LLC*, FCC File Nos. 0006867447 *et al.*; Letter from Sirius XM Radio Inc., RM-11750 (Aug. 7, 2015).

unwilling to make such modifications at certain locations due to their concerns about the customer impact of those modifications.

Accordingly, to ensure SiriusXM's subscribers' continued ability to receive satellite radio service at locations where wireless carriers believe they are unable to modify their facilities, SiriusXM has been exploring complementary and alternative solutions to mitigate the interference problem. One potential solution is the installation of a newly-designed Spot Repeater near AWS/PCS transmitter locations where intermodulation interference is occurring or is likely to occur in the near future. The use of Spot Repeaters may also be a valuable tool to address interference concerns as AT&T Inc. and its affiliates ("AT&T") – the primary license holder in the adjacent WCS band – deploys facilities and begins operations in that band. The main purpose of such repeaters would be to improve subscribers' reception of SiriusXM services where muting occurs due to interference from nearby wireless facilities.

As these Spot Repeaters are in the developmental stage and differ significantly from the FCC-certified terrestrial repeaters SiriusXM currently uses, an experimental license will be required to research and validate the technical and operational parameters necessary to accomplish their intended purpose. If these experimental activities are successful, SiriusXM will seek the appropriate equipment authorizations prior to manufacturing and permanent deployment of these repeaters. Thus, the proposed experiment carried out under the Part 5 license will contribute to the development of new "radio art" to mitigate intermodulation interference to SDARS services.<sup>3</sup>

### **Proposed Operation**

SiriusXM requests authority to install and operate experimental Spot Repeaters in a limited number of markets around the U.S. where intermodulation interference is occurring or is likely to occur. The maximum number of such locations would be five hundred (500), in the following geographic markets:

- New York City (Tri-state Market)
- Boston
- Chicago
- Los Angeles
- San Diego
- San Francisco Bay Area

As noted above, wireless carriers are rolling out their LTE networks nationwide and intermodulation interference may occur wherever AWS is deployed in combination with PCS at high power levels on the street. However, each geographic market is unique in various ways that may impact the design and operating parameters of the Spot Repeaters. For example, market-specific factors that will need to be evaluated include: the combination of PCS and AWS

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<sup>3</sup> Although SiriusXM would not object to the Commission's requiring experimental reports pursuant to Section 5.73 of the rules, such reports should be unnecessary in this circumstance given that SiriusXM is the sole holder of SDARS spectrum and will therefore be the only purchaser and operator of the proposed repeaters.

frequencies being deployed (which determines where in the SDARS spectrum intermodulation will occur); the number, location and technical parameters of AWS base stations being deployed; the number, location and technical parameters of existing SiriusXM terrestrial repeaters; local terrain and obstructions to coverage; existing SDARS coverage; and population densities. In effect, SiriusXM may need to customize Spot Repeater design and operations in each market to ensure that they will effectively mitigate the interference in each geographic location.

The Spot Repeaters will operate on the SDARS band, 2320-2345 MHz, which is already licensed to SiriusXM. Each repeater will transmit in both the former Sirius Satellite band (2320-2332.5 MHz, with a center frequency of 2326.25 MHz and a 4 MHz bandwidth) and the former XM Satellite Radio band (2332.5-2345 MHz with a center frequency of 2338.75 MHz and a 5 MHz bandwidth). These transmission bands match those in SiriusXM's blanket repeater license.<sup>4</sup>

The Spot Repeaters will operate with the following RF emission characteristics:

- Each repeater may have up to three sectors.
- The average equivalent isotropically radiated power (EIRP) for a sector shall not exceed 100 watts within either of the authorized bandwidths. The power density shall not exceed 25 watts within any 1 MHz of authorized bandwidth in the 4 MHz Sirius band, and shall not exceed 20 watts within any 1 MHz of authorized 5 MHz XM bandwidth.
- The peak-to-average power ratio (PAPR) of the repeater output power shall not exceed 13 dB for more than 0.1 percent of the time.

The proposed Spot Repeaters will operate with much lower power than is typical of the repeaters on SiriusXM's repeater network, which SiriusXM has operated for years with no known issues of interference. Thus, SiriusXM does not anticipate any interference to adjacent licensees from these repeaters.

The Commission has also established out-of-band emission ("OOBE") limits as a baseline to protect WCS receivers from SDARS repeater emissions. However, the Commission acknowledged that there are circumstances in which it is not necessary to apply these OOBE limits. Section 25.202(h)(3) of the Commission's rules states that SDARS repeaters may attenuate out-of-band emissions less than the levels specified in the rules unless the SDARS licensee has received notice from a potentially affected WCS licensee that it intends to commence commercial service within the following 365 days. SiriusXM proposes to operate the Spot Repeaters, on an experimental basis, in accordance with the following OOBE limits as permitted by the rules:

- The power of any emissions outside of the SDARS frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

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<sup>4</sup> Call Sign E110172, FCC File No. SES-LIC-20111121-01384 (granted Feb. 15, 2012).

- For a repeater transmitting with 2 watts - 100 watts per 5 MHz EIRP, not less than  $75 + 10 \log (P)$  dB on all frequencies outside of the 2320-2345 MHz band.
- For a repeater transmitting with less than 2 watts per 5 MHz EIRP, the above will apply except for:
  - on the frequencies 2316 - 2320 MHz and 2345 - 2349 MHz, not less than  $55 + 10 \log (P)$  dB;
  - on the frequencies 2312 - 2316 MHz and 2349 - 2353 MHz, not less than  $61 + 10 \log (P)$  dB; and
  - on the frequencies 2308 - 2312 MHz and 2353 - 2357 MHz, not less than  $67 + 10 \log (P)$  dB.

Allowing operations with the OOB levels specified above will facilitate development and speed deployment of Spot Repeaters and the interference-reducing benefits they are expected to provide. SiriusXM acknowledges that, pursuant to Section 25.202(h)(3), a potentially affected WCS licensee may provide an appropriate notice requiring SiriusXM to attenuate the repeater to the OOB limits specified in Sections 25.202(h)(1) and 25.202(h)(2). However, as the primary holder of WCS licenses, AT&T is the only entity that would likely provide a notice of commercial operations as a potentially affected WCS licensee. AT&T and SiriusXM have worked cooperatively in recent years, demonstrating how WCS and SDARS licensees can develop their own services while respecting the needs of the adjacent band licensee. In Exhibit 2 attached hereto, AT&T affirms its support of this application.<sup>5</sup>

SiriusXM will assemble the Spot Repeaters itself, using components from various equipment manufacturers expected to include, among others, Alcatel Lucent, Innovationszentrum Telekommunikationstechnik GmbH, Unique Broadband Systems, Hughes Network Systems, Pivotone Communication Technologies, Trilithic Inc, Mitec Telecom Inc., and SED Systems. SiriusXM will initially produce and deploy one hundred Spot Repeaters, using Model Number RR-50-xC-xxW. Based on the information gathered and lessons learned in the initial phases of the product trial, SiriusXM intends to develop a next generation of Spot Repeaters and deploy up to 400 units of that model under this license. The manufacturer or manufacturers of this next generation of Spot Repeaters will be determined based on the results from the initial phase of the trial.

SiriusXM will own the Spot Repeaters and will not market such devices to any third party. SiriusXM will maintain responsibility for the repeaters during and at the conclusion of the experiment. These repeaters will be used to deliver redundant services to subscribers to determine whether and how the repeaters are improving SDARS reception. However, just as with SiriusXM's existing terrestrial repeaters, subscribers will be unaware of the use of the experimental repeaters (other than the fact that the intermodulation interference to their services

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<sup>5</sup> SiriusXM has also informed the Aerospace and Flight Test Radio Coordinating Council, Inc. ("AFTRCC") of its plans to file the instant application. AFTRCC, which serves as an advocate for the aerospace industry on matters affecting spectrum policy and whose members use nearby frequency bands for flight testing and telemetry, has indicated that it supports the filing.

should hopefully improve) and no subscriber shall be charged any fees associated directly with the experimental repeaters.<sup>6</sup>

### **Conclusion**

In conclusion, SiriusXM faces the immediate and pressing need to ensure the continued reception of satellite radio service by subscribers whose reception has been or will be interrupted due to intermodulation interference in markets where certain AWS and PCS base stations operate with high power levels on the street. SiriusXM has sought the Commission's assistance pursuant to its rules and policies, and is continuing to work with wireless carriers such as T-Mobile, which is contributing resources and cooperating in an effort to find a solution. However, due to the need to remediate the interference in circumstances where wireless equipment will not be modified, SiriusXM is proactively exploring other solutions including the possibility of deploying a new low power spot repeater. SiriusXM now needs to determine whether such a solution is feasible for these locations and if so, what are the optimal technical and operating parameters for using these repeaters. The Commission can assist all parties involved in this interference matter by granting the requested experimental license.

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<sup>6</sup> Spot Repeaters will need to be located in areas where the satellite networks that feed the existing terrestrial network are blocked from view and unavailable. SiriusXM therefore intends to feed the experimental Spot Repeaters via internet protocol ("IP") delivery rather than directly by satellite. To ensure compliance with the Commission's requirements, the IP feed will replicate the programming that is also transmitted by the SDARS satellites, the experimental repeaters will not originate programming, and SiriusXM will not insert any other program material into the repeaters' feed that is not available via the SDARS satellite signals.