

Experimental License Status Report, April 2018
Call Sign WI2XJC

Sirius XM Radio Inc. (“SiriusXM”) herein provides a status report in connection with its application to renew the experimental radio license issued under Call Sign WI2XJC (the “License”).

The purpose of the License is to conduct experiments with new types of low power terrestrial repeaters that SiriusXM hopes will effectively mitigate interference caused to its satellite radio subscribers by wireless transmissions. The interference SiriusXM seeks to resolve includes intermodulation interference caused by nearby base stations operating on Advanced Wireless Services (“AWS”) and Personal Communications Service (“PCS”) spectrum as well as interference caused by operations in the adjacent Wireless Communications Service (“WCS”) band, most of which is licensed to AT&T and its subsidiaries. The repeaters operating under the License are intended to improve subscribers’ reception of SiriusXM services where muting is caused by interference from nearby wireless transmissions while facilitating those providers’ ability to optimize use of their spectrum for wireless broadband operations. Through the testing authorized under the License, SiriusXM continues to further its understanding of the potential uses of repeaters for interference mitigation and how best to optimize repeater placement and operations for that purpose.

The experiments initially conducted under the License include deploying and testing five experimental Interference Mitigation Repeaters (“IM Repeaters”) in mid-town Manhattan and New Jersey (within the 97 km radius of NYC). The experiments conducted to date – which target known areas of AWS/PCS interference – tested several, dual-band SDARS terrestrial repeater configurations, including:

- (1) 2W-per-band IP-fed IM Repeater
- (2) 20W-per-band IP-fed IM Repeaters

SiriusXM’s activities conducted under the License so far have tested and compared two different versions of repeaters fed by IP. Both of these repeaters differ from the repeaters authorized under SiriusXM’s blanket repeater license in several ways, including that the repeaters used under license receive programming directly from SiriusXM’s satellites, while the experimental versions receive programming through an internet feed that is identical to the programming on those satellites.

The IP-fed IM Repeaters -- both 2W- and 20W-per-band units -- are new repeater designs based upon the exciter hardware platforms from SiriusXM’s Dual Repeater Unit (“DRU”) series of production repeaters. The DRU exciter software on these units has been heavily modified to accept IP-based delivery of legacy Sirius band (2320-2332.5 MHz) and legacy XM band (2332.5-2345 MHz) service payloads, as well as precise dynamic timing information unique to each service stream and IP-fed repeater. Timing of repeaters is essential to the operation of single-frequency satellite/repeater networks such as that operated by SiriusXM.

To supply the IP payload streams, dynamic timing information, and Maintenance & Control (“M&C”) messaging, these units are being used to test a new IP-Headend and distribution architecture developed by SiriusXM for secure payload distribution and M&C messaging to IP-fed IM Repeaters over third-party WAN circuits.

The currently deployed experimental IP-fed IM Repeaters are located on the rooftops of buildings below 100 feet AGL. None of these installations allows a line-of-sight view to the SiriusXM satellites, necessitating IP-fed connections to deliver payload and M&C messaging. One 2W-per-band unit and one 20W-per-band unit are currently being tested in mid-town Manhattan. A second 20W-per-band unit is being tested in Union City, NJ, just outside the Lincoln tunnel. The IP-fed IM Repeaters incorporate a precision RF signal launch timing mechanism to ensure synchronization with all proximal SiriusXM terrestrial repeaters.

SiriusXM has identified additional AWS/PCS interference areas where testing should occur and the company is negotiating leases to install four additional experimental IP-fed IM Repeaters at these locations in and around Manhattan. Testing of these repeaters is expected to begin by the end of 2018, subject to the License’s renewal. Leases are still under negotiation for further testing of IP-fed IM Repeaters in Los Angeles and San Francisco.

The testing completed to this point indicates that the use of IM Repeaters should be highly effective in alleviating AWS/PCS intermodulation interference into SiriusXM receivers operating in both the legacy Sirius and legacy XM bands. These repeaters should be able to eliminate incidents of muting in all but the very highest on-ground AWS/PCS levels, and these usually occur in close proximity to the strongest AWS or PCS signal source.

Through the experiments conducted so far, SiriusXM has learned that the best mitigation performance occurs where:

- The IM Repeater is co-located or nearly co-located with the strongest interference source.
- The IM Repeater antenna pattern is low to moderate gain, providing a wider elevation beam-width, with good coverage fill below the IM Repeater location as well as outward from the site. In some cases, this requires the IM Repeater’s transmitter output power to be slightly higher to compensate for use of the lower/moderate antenna gain as compared to a higher gain antenna.

Further tests are in progress to determine the optimal IM Repeater configurations and deployments to address WCS interference into SiriusXM receivers. This type of interference may be far more widespread than interference from AWS/PCS sites, and interference mitigation may require true co-location with WCS transmitter sites. True co-location at WCS sites is expected to reveal additional dimensions for optimization, as well as untried variants for IP connectivity and systems integrations.

Incorporating the lessons learned from the initial testing program, SiriusXM expects to request authority shortly to expand the geographic scope of its experimental license. Following the conclusion of the testing program, SiriusXM hopes to authorize nationwide, long-term use of its terrestrial repeaters co-located at or near WCS, PCS, and AWS transmitter sites that are potentially

or actually creating interference to SDARS. SiriusXM and AT&T have initiated discussions toward that end, addressing items including the specifications of repeaters to be located at WCS sites, the rules for the interrelated operations of repeaters and WCS transmitters, the ownership and control of equipment, and deciding other related technical, legal, and operational issues.