

NARRATIVE DESCRIPTION

Pursuant to Sections 5.54(a)(1) the rules of the Federal Communication Commission (the “FCC” or “Commission”),¹ KeyW Corporation (“KeyW”) respectfully requests a conventional experimental license for a period of two (2) years commencing on the date its existing experimental special temporary authorization (“STA”) expires.² Under the *KeyW STA*, KeyW is authorized to: (i) test and evaluate its phased array antenna (the “KeyW Experimental Payload”) by transmitting in the 8025-8325 MHz (space-to-Earth) band; and (ii) operate a 1.5m tracking earth station antenna (the “KeyW Experimental Earth Station”) at a University of Arizona facility in Tucson, Arizona³ to transmit signals to the KeyW Experimental Payload in the 9200-10550 MHz (Earth-to-space) band.

KeyW’s existing experimental operations under the *KeyW STA* have not caused any interference incidents to-date, and there is no risk of increased interference given the additional protective measures described herein. As compared to KeyW’s expired experimental STA operations under Call Sign WO9XIO,⁴ which include experimental ground-to-air transmissions from KeyW’s facility near Baltimore Washington International Airport, the experimental operations proposed to your end will be conducted in a more limited in frequency range, at lower power, with a more directional (higher gain) antenna, and in a more remote location.

¹ See 47 C.F.R. §§ 5.54(a)(1).

² See KeyW Corporation, File No. 1403-EX-ST-2019, Call Sign WP9XWE (“*KeyW STA*”) (expires on November 1, 2020).

³ Geographic coordinates: 32° 05' 22.8" N, 110° 48' 33.1" W

⁴ See KeyW Corporation, File No. 0537-EX-ST-2019, Call Sign WO9XIO (authorizing KeyW to conduct, among other things, experimental ground-to-air operations in portions of the 8.45-12.0 GHz bands in support of similar U.S. government operations).

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Accordingly, the potential for interference associated with continuing to operate under the KeyW STA remains significantly low.

KeyW respectfully requests consideration and grant of the conventional experimental license by November 1, 2020, the same day of the expiration of the *KeyW STA*. KeyW has timely filed this application such that, since there is no increase in the potential for interference, it may continue to operate under its STA under the Commission acts on the instant request.⁵ The KeyW Experimental Payload will be a hosted payload on a non-geostationary satellite orbit (“NGSO”) cubesat – a LEMUR-2 satellite operated by Spire Global, Inc. (“Spire”)⁶ – which is scheduled to launch in December 2020. More recently, Spire filed an application to modify the *Spire License* in part to include independent authority to operate the KeyW Payload under Part 25 of the Commission’s rules.⁷ In support of that request, Spire provided a compatibility analysis demonstrating that the potential for interference from transmissions in the 9200-10550 MHz (Earth-to-space) from the KeyW Experimental Earth Station into a satellite is *de minimis*. In the interest of completeness and clarity, KeyW provides the compatibility analysis herein for review by the Office of Engineering and Technology.⁸

⁵ See 47 C.F.R. §§ 5.61(c) (“Extensions of an STA may be granted provided that an application for a conventional experimental license that is consistent with the terms and conditions of that STA (*i.e.*, there is no increase in interference potential to authorized services) has been filed at least 15 days prior to the expiration of the licensee's STA. When such an application is timely filed, operations may continue in accordance with the other terms and conditions of the STA pending disposition of the application, unless the applicant is notified otherwise by the Commission.”).

⁶ The LEMUR-2 satellite model has been previously authorized for commercial operation by the Commission. Spire has separately filed an experimental STA request to support this testing and demonstration mission. See Spire Global, Inc., File Nos. SAT-LOA-20151123-00078 & SAT-AMD-20180102-00001, Call Sign S2946, granted on Nov. 29, 2018 (“*Spire License*”); see also Spire Global, Inc., File No. 1228-EX-ST-2019 (“*Spire Experimental STA*”).

⁷ See Spire Global, Inc., File No. SAT-MOD-20200603-00065, Call Sign S2946 (“*Spire Modification*”). Upon grant of the *Spire Modification* application, KeyW agrees to withdraw its request for experimental authority to operate the KeyW Payload.

⁸ See KeyW Payload Compatibility Analysis.

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As described herein and other materials submitted with this application,⁹ a grant of the requested experimental license request would strongly serve the public interest. Due to unforeseen circumstances and administrative and operational challenges, the launch date of the KeyW Experimental Payload will likely not occur in the timeline as stated in the STA, and thus KeyW seeks this two-year license to ensure it maintains appropriate authority during the life of the mission. KeyW notes that no information from the previous filing has changed, and KeyW is incorporating by reference all previously submitted information to the FCC in this request for the purpose of this experimental license application. KeyW reserves the right to update this proceeding in order to provide the FCC with additional information, and will file a notification confirming an exact launch date once finalized.

I. DISCUSSION

KeyW provides diverse technology and cyber security solutions for government and commercial customers. The proposed experimental operations are an extension of the expired KeyW experimental operations under Call Sign WO9XIO and will allow KeyW to test key technical features of its antenna technology in a true space-based environment. The KeyW Experiment Payload was specifically designed to operate on Spire's LEMUR-2 satellite to facilitate evaluation of the on-orbit characteristics of KeyW's antenna. Experimental payload communications will commence as soon as possible following the LEMUR-2 satellite's deployment from the International Space Station ("ISS") in December 2020. To the extent applicable, KeyW incorporates by reference the spacecraft technical data, orbital characteristics, and related information provided in the *Spire License and Spire Experimental STA*

⁹ See, e.g., FCC Form 442, Technical Appendix and Confidential Exhibit 1. Due to the highly sensitive nature and security implications of the proposed operations, KeyW requests that Exhibit 1 be treated as confidential. See Confidential Treatment Request and Exhibit 1.

applications.¹⁰ Thus, this conventional experimental license request focuses on information related to the KeyW Experimental Payload and KeyW Experimental Earth Station only.

A. The KeyW Experimental Payload

The KeyW Experimental Payload is a steerable, transmit-receive phased array antenna. Payload downlink (earth station receive) operations will be conducted in the portions of the 8025-8325 MHz, which is consistent with the downlink authorization in the *Spire License*. Payload transmissions will be conducted using two modes: communications mode (using a transitional modulating carrier (QPSK)) and “chirp” mode (*i.e.*, a swept gaussian modulated sinusoidal waveform). During the term of this experimental license, the KeyW Experimental Payload will operate intermittently and on an as-needed basis to conduct experimental downlink transmissions during approximately one pass per day (approximately 6 to 8 minutes per pass) to the KeyW Experimental Earth Station in Tucson, Arizona.

KeyW’s temporary experimental operations have no regulatory status vis-à-vis other authorized users of the band and KeyW is working with U.S. government agencies to ensure its proposed experimental downlink operations do not cause interference to U.S. government operations. Particularly, KeyW has commenced discussions with NASA to ensure its ground station operations do not cause interference to U.S. government facilities in the southwestern United States. KeyW is also pursuing discussions with other U.S. government agencies and will adhere to any specific conditions or spectrum exclusions in the proposed downlink band.

B. The KeyW Experimental Earth Station

In addition to receiving transmissions from the KeyW Experimental Payload to evaluate its transmit capabilities, a primary purpose of the KeyW Experimental Earth Station is to

¹⁰ See *Spire License* and *Spire Experimental STA*.

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transmit to the payload to test the phased array antenna's performance. Because KeyW will operate the KeyW Experimental Earth Station at lower power levels than those authorized in its expired STA, the newly proposed uplink operations will be less interfering than those previously conducted by KeyW without interference incident. The basic operational characteristics of the KeyW Experimental Earth Station are set forth in Table 1, below.

Table 1. KeyW Experimental Earth Station Characteristics

Characteristics	Description
Antenna Type	Mechanically steered, parabolic tracking antenna
Antenna Size	1.5m (General Dynamics reflector)
Antenna Gain	40.2 dBi (8725 MHz), 41.2 dBi (9875 MHz) and 42.9 dBi (11950 MHz)
Antenna Orientation	Satellite Nadir
Half-Power Beamwidth	1.7° (87(25 MHz), 1.5° (1975 MHz), 1.2° (11950 MHz) (limited roll-off beyond 20° off boresite)
Tracking Rate	12° /sec azimuth; 7° /sec elevation (max)

Additional information regarding the KeyW Experimental Earth Station is provided in the attached Technical Appendix.

The 9200-10550 MHz band has various allocations for non-Federal uses, including a secondary allocation for radiolocation operations. The KeyW Experimental Earth Stations will track the satellite (and payload) as it passes over the site and will transmit and receive intermittently for brief periods while the satellite is in view (one pass per day for approximately 6-8 minutes), and will not operate below a minimum elevation angle of 10 degrees (or such other minimum elevation angle at azimuth as may be agreed with U.S. government representatives).

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There are two FCC-licensed operators in the 9200-10550 MHz band within a 50-mile radius of the proposed KeyW Experimental Earth Station site; Trimble Inc., Call Sign WQPL914 (located approximately 25.8 km away), and Airobotics Inc., Call Sign WRCH844 (located approximately 62.9 km away). KeyW has contacted these potentially affected licensees and received confirmation from Airobotics Inc. that it has no concerns regarding the proposed operations. KeyW understands that a similar response from Trimble Inc. is forthcoming and will update the Commission once their response has been confirmed.

With limited exception, KeyW acknowledges and accepts the conditions included in the *KeyW STA* and any such other conditions as may be appropriate for its conventional experimental operations in the Tucson, Arizona area. At all times, KeyW will adhere to its obligations under Part 5 of the Commission's rules to operate on an unprotected, non-interference basis during the term of the requested experimental STA.¹¹

C. Experimental Station Control & Contact Information

As operator of the KeyW Experiment Payload and KeyW Experimental Earth Station, KeyW will have the ability to immediately cease operations as appropriate and will cease transmission immediately in the unlikely event of harmful interference. The stop buzzer contact during experiment operations is:

Zach Baum
7736 Old Telegraph Road
Severn, MD 21144
Zachary.baum@keywcorp.com
+1.443.274.1480 (Office)
+1.318.348.5073 (Mobile)

¹¹ If KeyW learns its experimental operations are causing interference into existing spectrum users, it will immediately cease transmission and will not resume transmissions until it establishes that further harmful interference will not be caused to any authorized radio service. *See* 47 C.F.R. §5.84.

II. PUBLIC INTEREST CONSIDERATIONS

In accordance with Section 5.63(c)(1) of the Commission's rules,¹² KeyW anticipates that its proposed experimental operations will contribute greatly to the radio art and serve the public interest. The proposed experimental antenna evaluations will help validate the capabilities of an innovative antenna technology for the benefit of the U.S. public. Moreover, the proposed conventional license (as compared to the STA) will accommodate unforeseen changes to the mission schedule and ensure there are no lapses in service during the life of the mission to demonstrate its technology and cyber security solutions for government and commercial customers.

III. CONCLUSION

Based on the foregoing, KeyW respectfully requests that the Commission grant this conventional experimental license application by November 1, 2020 (or sooner if possible), to permit the described operation of the KeyW Experimental Payload in the 8025-8325 MHz (space-to-Earth) band and the KeyW Experimental Earth Station in the 9200-10550 MHz (Earth-to-space) band.

¹² 47 C.F.R. § 5.63(c)(1).