Southwest Research Institute
Application for License
File No. 0177-EX-PL-2016

SUPPORTING STATEMENT
FOR REQUEST FOR LICENSE

Pursuant to Section 5.3(a), (f) and (j) and Section 5.53 of the Federal Communications Commission ("FCC") rules, 47 C.F.R. §§ 5.3(a), (f), (j) and 5.53 (2014), Southwest Research Institute ("SwRI") respectfully requests a license to complete its evaluation of the performance characteristics of narrowband, frequency hopping transmissions in selected HF bands below 25 MHz.

Grant of this application would serve to replace the existing special temporary authorization ("STA") issued to SwRI for experimentation granted under File No 0798-EX-ST-2015, call sign WJ9XAB, which is scheduled to expire on March 17, 2016. That STA allowed the company test the technical characteristics of prototype equipment and determine if additional testing would be beneficial to its research and development efforts.

As provided under Section 5.61(c) of the Commission's rules, 47 C.F.R. § 5.61(c) (2014), this application is also intended to serve as a continuance or extension of the above-referenced STA pending action on this application. SwRI understands, however, that such continuance or extension applies only to the locations and channels as authorized and as conditioned under the STA and that the company must await action on this application for a regular license before it may operate at the additional locations or on additional spectrum, or in any manner proposed in this application that is at variance with the operations authorized or conditioned under the STA. A short extension as requested herein is necessary to allow the company to complete its technical tests pending Commission action on this application.

In support of SwRI's request, the following is shown:

1) Applicant's Address, Background and FRN:

Southwest Research Institute is headquartered at 6220 Culebra Road, San Antonio, TX 78238-5166. It is an independent, not-for-profit, applied engineering and development organization devoted to technology development and transfer. It conducts business with the industry and government (U.S. and other friendly nations) on a worldwide basis. Approximately 50% of the SwRI's business is for the U.S. Government. Its FCC Registration Number ("FRN") is 0004074217.

2) Need for License:

SwRI seeks an experimental license for a 7-month period so that it may complete a limited set of tests for several days during the period March 17, 2016 through November 17, 2016, to obtain real-world data samples of the characteristics of narrowband, frequency hopping HF transmissions.

3) Purpose and Description of Operation:

As noted above, the experimental authority requested herein will allow SwRI to the test the performance characteristics of narrowband, frequency hopping HF transmissions. This evaluation will include an assessment of the propagation and functionality of such transmissions and their ability to communicate under varying conditions. Specifically, SwRI seeks to obtain real-world data samples of the characteristics of narrowband, frequency hopping HF transmission techniques for both single channel detection, angle of arrival, and time differences of arrival ("TDOA") across these bands..

4) Dates of Proposed Operation:

March 17, 2016 through November 17, 2016

5) Location(s) of Proposed Operations:

The tests will be conducted within the campus of Southwest Research Institute, 6220 Culebra Road, San Antonio (Bexar County), Texas. Operations will be at temporary fixed locations within a 1 km radius of NL 29-26-29; WL 98-37-56 (NAD 83). SwRI's campus is comprised of approximately 1200 acres, and the location of the test transmitter antenna would be near the center of the campus. The nearest off-campus property is over 800 meters away.

6) Class of Station:

The FCC station class code for the proposed operation is "FX." A limited number of mobile units may be located at temporarily fixed locations on the campus as described above.

7) Equipment To Be Used:

SwRI proposes to operate a single fixed base station capable of operating in the requested bands. Specifically, it proposes to deploy an Agilent E4438C Agile Signal Generator with RF output levels in the range of -40 dBm to 13 dBm feeding a vertically oriented 3 meter long monopole at a location 1.4 km from from the array center. SwRI will use a receive antenna with an 8-element circularly disposed antenna array of eight 6.5 meter Tilted Folded quad-summed Dipoles (TURNSTILES) with a radius of 40 meters.

8) Frequencies Desired:

As stated in Section 3, SwRI seeks to obtain real-world data samples of the characteristics of frequency hopping transmissions in the HF spectrum. Thus, it is critical to SwRI to conduct tests in several HF bands with a range of signal to noise ratios ("SNRs"). Specifically, SwRI proposes to operate in the HF bands in selected HF bands between 6.2 MHz and 22.8 MHz specified in Attachment A. It does not propose, however, operating on channel centers deployed by licensees

in the public safety (radio service code “PW”), aeronautical fixed (“AF”) or public coast (“PC”) radio services. Company personnel will also monitor the operations of other users before commencing transmissions to avoid interference to such users.

SwRI also recognizes that the use of certain frequencies will require coordination through the Interdepartment Radio Advisory Committee (“IRAC”) and SwRI is amendable to deleting certain frequencies from the bands requested and coordinating with Federal government personnel prior to commencing any transmissions.

9) Power Level:

SwRI will operate with the minimum necessary power to conduct its test, and in no event will that level exceed a peak of 1 Watt Effective Radiated Power (“ERP”).

10) Type of Emission, Modulation Technique, and Bandwidth Required:

SwRI proposes to use computer-generated pseudorandom bit streams of data files generated in Matlab, and these bit streams will be modulated using narrowband (2,4,8 level) FSK and PSK techniques with baud rates between 100 and 2400 baud with bandwidths limited to 3.2 kHz or less. The narrowband signal will be divided into appropriate duration dwells to match 5, 10, 20, and 30 hops per second and modulated onto carriers spanning 100 kHz, 200 kHz, and 300 kHz bandwidths with channel spacing of 1 kHz.

The primary emission designator for such operations is 3K20D1D, as indicated on the accompanying FCC Form. Other emission modes and modulation techniques may be utilized, but in no event will the emissions extend beyond the limits associated with the above-referenced emission. SWRI does not propose to supply station identification as set forth in Section 5.115 of the Commission's Rules.

11) Overall Height of Antenna(s) Above Ground:

SwRI will comply with all Federal Aviation Administration (“FAA”) and FCC rules and regulations regarding the installation and operation of antennas and their support structures. The antennas to be deployed under this authority will not extend more than six meters above the ground or, if mounted on an existing building or tower, will not extend more than six meters above the building or above the FAA/FCC approved height for a tower or building.

12) Restrictions on Operation

SwRI expects that the durations of any single HF transmission will range between 5 and 10 seconds. The duty cycle on each dwell will be constant within any single transmission, but will be varied between subsequent transmissions to range between 50 and 100%. The sequence of hopping channels will be computer generated pseudorandom, but controlled to ensure minimal reuse of any single channel during a transmission. At least one minute will elapse between any successive transmissions.

SwRI anticipates that the initial transmissions will be performed within one 8 hour period. An analysis to assess the quality of collection will require at least one day and, if necessary, SwRI may need to re-conduct certain portions of the test. Thus, the likely duration of all tests is expected to be less than 16 hours. SwRI has requested a license to accommodate the fact that it does not currently know exactly when those tests will be conducted within that period.

Moreover, SwRI does not propose to market, sell, or lease unapproved equipment to end users or conduct a market study in conjunction with this test. After the completion of the tests, SwRI will recall and recover all devices that do not comply with FCC regulations. If any different treatment becomes necessary during the course of its experimentation, SwRI will seek separate and additional authority from the agency.

Last, SwRI understands that: (a) permission to operate the units has been granted under experimental authority issued by the Federal Communications Commission, is strictly temporary, and may be cancelled at any time and that (b) operation is subject to the condition that it not cause harmful interference.

13) Interference Protection/Stop Buzzer Contact Information:

SwRI understands that other stations may be licensed in the bands it has requested and that, if any interference occurs, it may be required to discontinue its operations immediately. It does not expect interference to occur, however, as its tests will be conducted only on a limited basis as described above. Moreover, SwRI personnel will be monitoring the RF spectrum and will carefully select areas of the HF spectrum to minimize any interference with observable transmissions.

As discussed earlier, SwRI recognizes that his request will need to be coordinated by the Commission through the IRAC, and SwRI is amendable to deleting certain frequencies from the bands requested and coordinating with Federal government personnel prior to commencing any transmissions.

In that regard, SwRI advises the Commission that John Tinsley, Staff Scientist, is the technical contact overseeing these tests. He will be personally responsible for the operations and will serve as the “stop buzzer” in the event that operations must be terminated because of any interference concerns. Mr. Tinsley can be reached at (210) 522-6285, email: john.tinsley@swri.org.

14) Compliance With Human Exposure Limits:

SwRI certifies that it will operate under this license in full compliance with IEEE C95.1 - 1991, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." All personnel who will operate the equipment are knowledgeable as to the effects of RF energy and will have the ability to control their exposure.

15) Application Contact Information:

Company Contact:

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ATTACHMENT A

Proposed Bands of Operation

Although frequency bands are specified below, SwRI proposes to operate on frequencies with a 3.2 kHz bandwidth as described in the supporting statement. SwRI would agree to special conditions on the face of the grant of authority that limit operations to certain frequencies or that restrict the use of certain frequencies or sub-bands.

6.2 – 6.5 MHz
10.2 – 11.7 MHz
16.4 – 17.4 MHz
22.0 – 22.8 MHz