Narrative

Pursuant to the Federal Communications Commission ("FCC") rules, 47 C.F.R. §§ 5.3(a), (e), (f) and (j); 5.51; 5.54(a)(1); and 5.71(a), Anduril Industries, Inc. ("Anduril") respectfully requests experimental authority so that it may support government contract related testing of communications between unmanned aerial systems ("UAS") and a controller and radar systems useful in tracking UAS. The proposed experiment, frequency bands, and equipment represent a modified version of ELS File No. 0528-EX-CN-2021, which the Commission dismissed without prejudice because it sought to use a Pulsar software-defined radio system to engage existing communications links to UAS.[1] The present application omits the Pulsar radio that might engage existing communications links used by UAS devices. This application is limited to a request for authority to test radar, radiolocation, and radiocommunication systems. As shown below, the Interdepartment Radio Advisory Committee ("IRAC") of the National Telecommunications and Information Administration ("NTIA") reviewed and approved non-governmental use of the frequencies Anduril has sought in the present application pursuant to the prior experimental licensing request.

Specifically, Anduril seeks to conduct tests on a temporary, non-interference, non-protected basis at its remote, rural sites near Capistrano, California and Apple Valley, California, which have the capability to support needed testing while meeting the safeguards designed to prevent potential telecommunications disruptions by virtue of their rural locations. Anduril will fully coordinate and operate on a non-interference, non-protected basis with anyone affected or reasonably likely to be affected.

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

1) Company Background:

Anduril Industries, Inc. is headquartered in Irvine, California. Its address and FCC Registration Number ("FRN") are provided below:

Anduril Industries, Inc.
2722 Michelson Dr
Irvine, CA 92612

FRN: 0028824514

Anduril is a private, for-profit engineering company devoted to technology development for security and defense applications by the U.S. Government. Approximately 80% of Anduril's business is for the U.S Government.

2) Need for Experimental Authority:

As noted above, Anduril seeks experimental authority so that it may temporarily support third-party government contract related testing. Anduril seeks to conduct tests on a temporary basis at its facilities located at remote, rural sites near Capistrano, California and Apple Valley, California, which have the capability to support needed testing while meeting

[1] *See* ELS File No. 0528-EX-CN-2021 (filed July 9, 2021).

the safeguards designed to prevent potential telecommunications disruptions by virtue of their rural locations.

The experimental authority requested by this application would allow Anduril to support testing (observation, monitoring, and evaluation of the below-described devices within the requested bandwidths) for the duration of the experimental authority. Anduril has requested experimental authority for a term of 24 months (from October 15, 2021 to October 15, 2023) to provide flexibility should variations in government and contractor COVID travel requirements or issues with inclement weather arise.

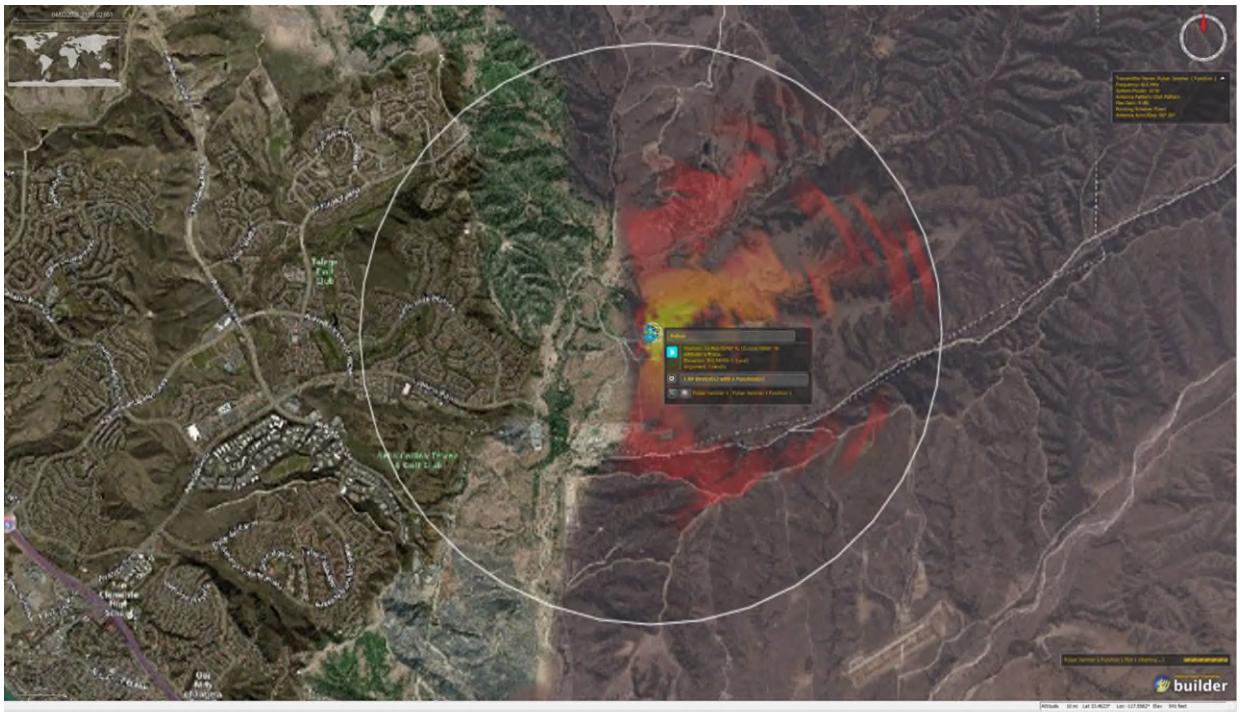
3) Location of Test Site:

After completing a careful site selection process, Anduril proposes to conduct experimental testing at two facilities in rural areas of Southern California with little to no population density. As a result, Anduril's operations will not cause harmful interference to any other neighboring operations or individuals.

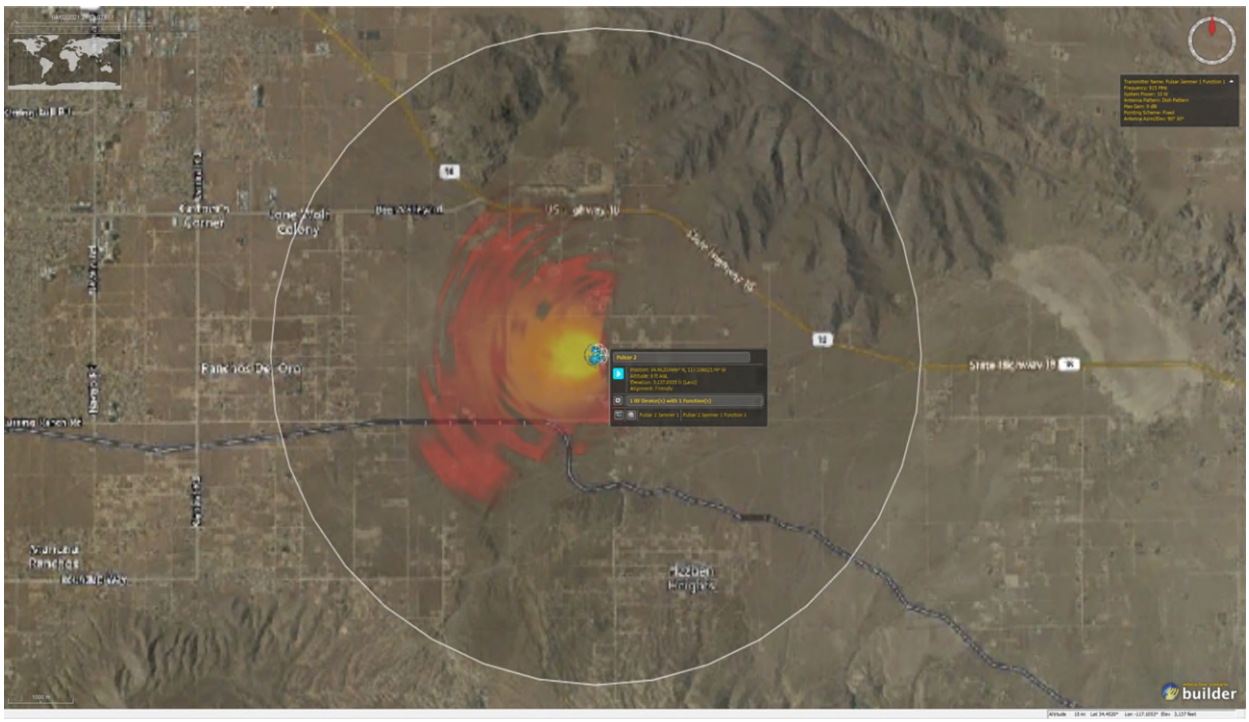
- Capistrano Test Site ("CTS") – This 2700 acre property is located in rural Southern California at 33°27'43.3"N 117°33'31.1"W.
- Apple Valley ("AV") – This 3500 acre property is located in rural Southern California at 34°27'8.514"N, 117°6'21.1031"W.

The operations to be conducted under the requested experimental authority will be limited to a radius of 2 km from the center of these coordinates. From the center of the test range, the distance to the properties' borders is greater than 2 km. Moreover, higher terrain surrounding the test site would serve to shield these urban areas from the proposed operations. See images below.

CTS



AV



4) Frequencies Desired:

Anduril seeks authority to operate on a subset of frequencies listed in Form 442 and reproduced here in Attachment A.

Anduril acknowledges that it must operate on a secondary, non-interference basis and that the selection of different frequencies may be necessary to avoid the potential for interference. If, during testing, Anduril determines that there is a potential to cause interference by using a frequency within the bands listed in the Attachment A, it will operate on another frequency, provided such frequency is not within the restricted frequencies set forth in 47 C.F.R. § 15.205.

Anduril also recognizes that its proposed experimentation will require coordination not only with the IRAC of the NTIA, but also with existing non-Federal government licensees authorized on the requested frequencies.

As shown below, the IRAC reviewed and approved non-governmental use of the frequencies Anduril has sought in the current application pursuant to a prior experimental licensing request, ELS File No. 0528-EX-CN-2021.[2]

[2] *See* ELS File No. 0528-EX-CN-2021 (filed July 9, 2021).

0528-EX-CN-2021 NG	250501	ACCEPT	Jul 23 2021	Aug 5 2021	M4400.00000	WL	2XZE
0528-EX-CN-2021 NG	250502	ACCEPT	Jul 23 2021	Aug 5 2021	M3300.00000	WL	2XZE
0528-EX-CN-2021 NG	250507	ACCEPT	Jul 23 2021	Aug 5 2021	M4400.00000	WL	2XZE
0528-EX-CN-2021 NG	250508	ACCEPT	Jul 23 2021	Aug 5 2021	M3300.00000	WL	2XZE
0528-EX-CN-2021 NG	250509	ACCEPT	Jul 23 2021	Aug 5 2021	M24450.0000	WL	2XZE
0528-EX-CN-2021 NG	250510	ACCEPT	Jul 23 2021	Aug 5 2021	M24450.0000	WL	2XZE

IRAC's prior approval of frequencies suitable for radar operations that Anduril has requested here supports expeditious grant of the present application.[3]

Anduril will fully coordinate and operate on a non-interference, non-protected basis with anyone affected or reasonably likely to be affected. Accordingly, if a particular frequency or set of frequencies in any band Anduril has requested is not available due to Federal government or non-Federal government use, Anduril would be agreeable to a restriction on, or carve out of, that frequency or frequencies as suggested by spectrum coordinators.

5) Power Levels:

Anduril will operate with the minimum necessary power to conduct its research and evaluations, but it will not exceed the power levels specified in the application and in Attachment A.

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

Operations will be conducted primarily with the emissions and modulation techniques specified in the application and in Attachment A. If other emission modes and modulation techniques are utilized, in no event will the emissions extend beyond the frequency bandwidths or bands requested.

Anduril does not propose to supply station identification as set forth in 47 C.F.R. § 5.115.

7) Equipment and Duty Cycle to Be Used:

Anduril proposes to deploy not more than a total of four (4) temporary fixed base station units during the experimentation. Currently, it proposes to operate the following devices:

a) Rada RPS-42 Radar (a radiolocation system that will not be used for radio navigation)

b) Rada RPS-82 Radar (a radiolocation system that will not be used for radio navigation)

c) EchoGuard CR (a radiolocation system that will not be used for radio navigation)

[3] As discussed above, the Commission dismissed a prior Anduril application without prejudice because Anduril sought to use a Pulsar software-defined radio system to engage existing communications links to UAS. *See* Letter from Anthony Serafini, Chief, Experimental Licensing Branch, FCC, to Nathaniel Edwards, Anduril Industries, Inc., ELS File No. 0528-EX-CN-2021 (Sept. 9, 2021). In this application, Anduril has excluded the Pulsar radio and its corresponding frequencies. The present application is limited to a request for authority to test radar, radiolocation and radiocommunication systems.

d) StreamCaster 4200 (for communication between the UAS and a controller)

The testing to be conducted under the requested authority will be generally intermittent. Testing of the –

- StreamCaster will not be continuous and will occur for a period of 10 hours or less during any 24-hour period.
- RPS-42 may be continuous during a 24-hour period but will include periods when the RPS-42 and RPS-82 are not transmitting simultaneously.
- RPS-82 may be continuous during a 24-hour period but will include periods when the RPS-42 and RPS-82 are not transmitting simultaneously.
- EchoGuard CR will be continuous during a 24-hour period.

8) Antenna Information and Compliance with Human Exposure Limits:

Anduril clarifies the directional antenna information for Question 7 of Form 442, as follows.

Apple Valley, California – Directional Antenna
Width of beam in degrees at the half-power point: HPBW Horizontal: 90 degrees; HPBW Vertical: 70 degrees
Orientation in horizontal plane (degrees from True North): 270 degrees
Orientation in vertical plane (degrees from horizontal): 20 degrees

Capistrano, California – Directional Antenna
Width of beam in degrees at the half-power point: HPBW Horizontal: 90 degrees; HPBW Vertical: 70 degrees
Orientation in horizontal plane (degrees from True North): 45 degrees
Orientation in vertical plane (degrees from horizontal): 20 degrees

Anduril 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 the authority requested will typically not extend more than six meters above ground or more than six meters above a building, but in no case will they extend more than ten meters above ground level.

All power levels will comply with the limits set forth in the FCC's rules, including those relating to human exposure to radiation. In addition, 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.

9) Restrictions on Operation:

Anduril understands that other stations may be licensed on the channels it has requested and that, if any interference occurs, it may be required to discontinue its operations immediately. Anduril does not expect such interference to occur, however, as its tests will be conducted only on a limited basis as described above in a remote rural area that is shielded by surrounding terrain.

Anduril also recognizes that permission to operate under FCC experimental authority confers no long-term rights and is subject to the condition that Anduril not cause harmful interference.

Moreover, Anduril 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, Anduril 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, Anduril will seek separate and additional authority from the agency.

10) Interference Protection/Stop Buzzer Contact Information:

As noted above, Anduril recognizes that the operation of any equipment under experimental authority must not cause harmful interference to authorized facilities and that this application may need to be coordinated by the FCC with IRAC/NTIA. Should interference occur, Anduril will take immediate steps to resolve the interference, including if necessary, arranging for the discontinuance of operation. Notwithstanding these precautions, Anduril believes that its experimental operations are unlikely to cause interference. It proposes to limit the power and transmitting times of the proposed tests to the minimum necessary to conduct its evaluations and the operations will be limited to temporary fixed locations within a 2 km radius of the center coordinates specified in the application.

Anduril advises the FCC that Sam El-Akkad is the technical contact for this request and that he will serve as the “stop buzzer” in the event that operations must be terminated because of any interference concerns. He can be reached at telephone: 480-242-0980; email: selakkad@anduril.com.

11) Contact Information:

Technical and “Stop Buzzer” Contact:

Sam El-Akkad
Principal Electrical Engineer
Anduril Industries, Inc.

2722 Michelson Dr, Irvine, CA 92612
Telephone: 480-242-0980; Email: selakkad@anduril.com

ANDURIL

Anduril Industries | 2722 Michelson Drive | Irvine, CA 92612 | U.S.A.

Attachment A

Proposed Frequencies

As noted in the accompanying "Narrative," Anduril, in the instant request, seeks authority to operate on a subset of frequencies listed in the table below on a temporary, non-protected, non-interference basis at its remote, rural test sites near Capistrano and Apple Valley, California.

Anduril acknowledges that it must operate on a secondary, non-interference basis and that the selection of different frequencies may be necessary to avoid the potential for interference. If during testing Anduril determines that there is a potential to cause interference by using one or more of the frequencies listed in Attachment A, it will operate on other channels, provided such channels are not within the restricted frequencies set forth in 47 C.F.R. § 15.205.

Anduril also recognizes that its proposed experimentation may require coordination not only with Interdepartment Radio Advisory Committee of the National Telecommunications and Information Administration, but also with existing non-Federal government licensees authorized on the requested frequencies. Anduril will fully coordinate and operate on a non-interference, non-protected basis with anyone affected or reasonably likely to be affected. Accordingly, if a particular frequency or set of frequencies in any band Anduril has requested is not available due to Federal government or non-Federal government use, Anduril would be agreeable to a restriction on, or carve out of, that frequency or frequencies as suggested by spectrum coordinators.

Equipment	Frequencies (MHz)	Emission Designators	Modulation Technique	ERP (mean)[1]
StreamCaster 4200	4400-4940	5M64D7W 11M3D7W 22M6D7W	OFDM	4 watts
Rada RPS-42 Radar	3300-3400[2]	43M0M1N 21M5M1N 5M50M1N 4M40M1N 3M70M1N 17M6M1N	Coded Pulse Radar	328 watts

[1] To avoid numerous duplicative entries in the Form 442 for the two devices using the 3300-3400 MHz band, Anduril listed the worst-case power level associated with the RPS-82 equipment.

[2] Anduril understands the 3300-3400 MHz band and adjacent spectrum will likely support future 5G services. Given the remote, rural, terrain-protected, and temporary nature of Anduril's services—which are distant from urban 5G services unlikely to fully deploy before Anduril's two-year experimental term expires—and Anduril's assurance to operate on a non-harmful interference basis and discontinue experiments, if necessary, grant of the proposed experiment is in the public interest.

Equipment	Frequencies (MHz)	Emission Designators	Modulation Technique	ERP (mean)[1]
		14M7M1N 11M0M1N 8M80M1N 7M30M1N		
Rada RPS-82 Radar	3300-3400	43M0M1N 21M5M1N 5M50M1N 4M40M1N 3M70M1N 17M6M1N 14M7M1N 11M0M1N 8M80M1N 7M30M1N	Coded Pulse Radar	1259 watts
Echodyne EchoGuard CR	24450-24650	47M1F0N	Coded Pulse Radar	4 watts