

STA Narrative

Introduction:

By the instant application (“Application”), Caos Capital, LLC, request that the Federal Communications Commission (“FCC”) grant Experimental Special Temporary Authority to operate the facilities specified in the instant Application for the period of six months, beginning on October 1, 2023.

Caos Capital requests authority to continue testing a prototype radar system in order to (i) determine the necessary EIRP of a custom radio frequency transmitter device, (ii) measure waveform parameters, and (iii) record the return of the transmitted pulse between two receivers which are spatially in the same location. In particular, Caos Capital intends to conduct experimental operations to determine how closely it can synchronize receiving a transmitted pulse into two receivers, with the goal of developing precision synchronization of spatially separate RF receivers.

Previously, the FCC granted an Experimental STA for Caos Capital to operate in the 144-148 MHz band (2019-EX-ST-2022, “STA Authorization”). Subsequently, the FCC granted Caos Capital’s request for a conventional experimental authorization to continue to test in the 144-148 MHz band (1080-EX-CN-2023, “Conventional License”). The instant Application requests experimental authorization to conduct further tests, this time in the 220-225 MHz and 450-462 MHz bands.

As with the prior applications, Caos Capital intends to aim the main beam at a portion of elevated ground at an unpopulated mountain-top located approximately 15 miles away (coordinates: 33.79241238647887, -118.40244467886235), at elevation of approximately 220 meters above ground level, and measure the backscatter. Further testing in new frequency bands is necessary as Caos Capital has determined that atmospheric conditions were affecting the ability of Caos Capital personnel to receive the transmitted pulse signals.

As a result, Caos Capital continues to develop and refine new signal processing algorithms that will increase its ability to detect and receive the transmitted pulse signals. No change to the transmission equipment previously authorized in the STA Authorization or Conventional License will be necessary, and the technical information provided in the STA Request and Conventional License application, as amended, remains true and correct.

Approval of the instant request will permit Caos Capital to continue testing a new prototype radar device that can be used to enhance public safety and support the application of new technological approaches in the radar systems.

Technical Specifications:

1) Frequencies Desired: Caos Capital requests authorization to operate on the frequencies specified in the Application:

- a) 220-225 MHz;
- b) 450-462 MHz.

The specified frequencies were intentionally selected to eliminate any conflicts with spectrum allocated for aeronautical purposes, requiring pre-coordination with the Federal Aviation Administration, and with Broadcast television operations in the 210-216 MHz band.

2) Transmit and Effective Radiated Power Levels: The unit to be tested will operate with a range of transmit power levels, beginning with 1 watt. The Application specifies a maximum transmit power of 1000 W, and a peak maximum effective radiated power of 3981 W.

Caos intends to continue using an Ettus software-defined radio, along with commercially-available, off-the-shelf RF components, including (i) an amplifier (creating up to 3981 watts of EIRP using the 9.5 dBi antenna), (ii) bandpass filters, and (iii) a TV-style VHF antenna with a 70-degree wide main beam. The Antenna Gain is 9.5 dBi in the main beam.

3) Modulation and Emissions: The unit is capable of operating with either frequency or phase modulation. The Application specifies emission designators for both frequency and phase modulations.

4) Antenna Information: The antenna will be mounted in a manner that will not require prior approval under FAA or FCC rules and regulations.

- a) Width of beam in degrees at the half-power point:
 - i) H-Plane: 140 degrees;
 - ii) E-Plane: 70 degrees;
- b) Orientation: Caos intends to radiate either in full horizontal polarization or full vertical polarization at any given time, but not both simultaneously. In the vertical plane, we will be oriented to point from 0 degrees up to 60 degrees off the horizon.
- c) The Antenna Gain is 9.5 dBi in the main beam.
- d) The Azimuth Direction is 182.25 degrees from fixed site to target.

5) Operations: Caos will conduct the proposed tests with no more than one (1) unit operating at a time. The unit will operate with up to a 30% duty cycle, and transmissions will be no more than 300 milliseconds long. It is expected that the testing of the unit will be no more than 1 hour per day, at intervening periods during the STA period.

6) Radiation Hazard Analysis: Caos Capital has confirmed that the proposed operations will comply with the FCC's RF exposure guidelines with respect to the prototype antennas and test station transmissions, for uncontrolled (general population) and controlled (occupational) environments, as specified by Section 1.1310 of the Commission's rules.

In particular, the testing will occur on private property, with restricted access only to authorized personnel. The transmitting antenna will be installed on the roof of a building, at least 30 feet above any area where the general public or any occupational workers will be located. The antenna's main beam will be pointed towards the sky at an angle greater than 40 degrees above the horizon, such that no part of the main beam will hit any area where the general population or occupational workers will be located. The transmissions will be for very short periods of time, no more than 200 μ s pulse, and a 20% duty cycle, for no more than a few seconds at a time.

Hence, any transmissions will not occur in proximity to and will comply with the exposure limits with respect to the general population. All Caos Capital personnel operating and maintaining the equipment will be trained on proper handling of the equipment to mitigate radiofrequency exposure. Furthermore, all transmissions will be positively controlled by Caos Capital personnel during testing who will be able to cease transmissions at any time.

Interference Mitigation:

Caos is well aware of its obligations under Part 5 of the Commission's rules to avoid interference to co-channel licensees in non-experimental services, and will take all necessary steps to ensure compliance with this obligation. Should interference occur, Caos will take immediate steps to resolve the interference, including discontinuing operations if necessary. To date, no interference complaints have been received during the STA Authorization period.

In addition, the following factors will help mitigate any interference issues:

1. Each test will be limited in time and location to protect other spectrum users.
2. Emissions will be active for short durations no longer than 1 minute at a time. During a test, emissions will be activated periodically, and will not be continuous.
3. The site specified in the Application is more than six (6) kilometers from the closest airport.
4. A waiver of the Station ID requirements of Section 5.115(a) of the Commission's rules is requested.

Stop Buzzer:

The following will be available by wireless telephone and will act as the “stop buzzer” if any issues arise during testing:

- Primary: **Bo Marr** – Mobile: 310-487-5016;
- Secondary: **Daniel Thompson** – Mobile: 405-388-0692.

Distance between:

33 51 42. N Latitude, 118 23 57. W Longitude (Point 1)

As decimals: 33.8616667 Latitude, -118.3991667 Longitude

and

33 47 32.68 N Latitude, 118 24 8.79 W Longitude (Point 2)

As decimals: 33.7924111 Latitude, -118.4024417 Longitude

Distance = 7.688 km (4.777 miles)

via the method in Sections 73.208 and 73.611(d)

This method is only suitable for distances up to 475 km (295 miles).

Azimuth, Point 1 to Point 2: 182.25° True

Azimuth, Point 2 to Point 1: 2.25 ° True

[Return to Data Input](#)[Print Results](#)

To find the terminal coordinates given a bearing and a distance
use the [Terminal Coordinates](#) function.