From: Austin Weber

To: Nimesh Sangani
Date: February 12, 2021

Subject: Additional Information Request

Message:

Hello Nimesh,

Here are the responses to your request. New and updated documents should have been successfully uploaded as exhibits to our application.

1) Are you providing a commercial service under this experimental license? (Yes/No)

No, we are not providing a commercial service under this experimental license.

2) The ODAR that you submitted is not signed. Please submit a signed version of your ODAR.

The ODAR has now been signed and uploaded as an exhibit to the FCC 442 application, as well as included in the accompanying email.

3) Provide the nearest Apogee and Perigee value from where you will be conducting the experiments.

At deployment, the Cesium spacecraft will have an apogee and perigee of 550 km. Over the course of the five-year lifetime of the mission, if the thrusters are not used to sustain an orbital altitude of 550 km, the spacecraft altitudes will gradually decrease to an end-of-mission apogee of ~524.9 km and perigee of ~500.3 km.

4) Provide NTIA Space Record form. Do this for each frequency request.

The NTIA Space Record form has been filled out for each frequency request in one complete document. It has been submitted as an exhibit to the FCC 442 application, as well as included in the accompanying email response.

5) Explain your communication path. How do you plan to use each frequency that you're requesting?

The Nightingale 1 frequencies 27.0 – 27.5 GHz uplink and downlink will be used for satellite and payload TT&C as well as data transfer for Earth-to-space and space-to-Earth with Cesium ground stations. The center frequency for these transmissions is 27.2 GHz, with necessary bandwidths of 400 MHz, 200 MHz, and 100 MHz. These frequencies will be used by our active phased array payload for experiments. Nightingale 1 has 100 MHz of instantaneous bandwidth but can operate from 24.0 – 29.5 GHz. One objective of this experiment is to demonstrate the tunability over a 200 – 400 MHz subset of this range.

The SRS-3 frequencies 2210.68 – 2211.32 and 2214.68 – 2215.32 MHz downlink and 2061.075 – 2061.325 MHz uplink will be used for satellite and payload TT&C as well as data transfer for Earth-to-space and space-to-Earth with Cesium ground stations. The center frequencies for these downlink transmissions are 2211 MHz and 2215 MHz, with a necessary bandwidth of 640 kHz. The center frequency for these uplink transmissions is 2061.2 MHz, with a necessary bandwidth of 250 kHz.

The EyeStar-S3 simplex frequencies 1615 – 1617.5 MHz transmit will be used for satellite telemetry beacon to the GlobalStar constellation. The center frequency for these transmissions is 1616.25 MHz, with a necessary bandwidth of 2.5 MHz.

The EyeStar-D2 duplex frequencies 1615.025 – 1617.5 MHz transmit and 2483.765 – 2499.775 MHz receive will be used for satellite and payload TT&C as well as small data transfer through the GlobalStar constellation. The center frequencies for this transmit frequency band are 1615.65 MHz and 1616.88 MHz, with a necessary bandwidth of 1.23 MHz. The center frequencies for the receiving frequency band are GlobalStar frequencies, with a necessary bandwidth of 1.23 MHz.

The CommPack frequencies 2439.8 – 2442.2 MHz transmit and receive will be used for space-to-space data transfer and TT&C between the two spacecraft in the mission (Cesium Satellite 1 and Cesium Satellite 2). The center frequency for transmit and receive is 2441 MHz, with necessary bandwidths of 2.4 MHz, 1.2 MHz, and 600 kHz. This transmitter is experimental, and on-orbit tests will be used to prove in-situ performance as well as provide our customer base with increased confidence in the product. The CommPack system has two antennas, each on opposite sides of the spacecraft. When transmitting, both antennas are active simultaneously.

We have conducted a few license searches using the IBFS and ULS databases and found there are a few licensees in our requested bands. While it appears that there the chance for interference is low, we are open to coordination regarding any band overlaps.

6) 2200-2290 MHz band request and the 2025-2110 MHz band request are extremely wide. Narrow this down to the specific frequency band that you need to conduct or support your experiment. Revise your other frequency request and verify that you're requesting frequency that you absolutely need to perform this experiment.

The frequencies initially requested have been reviewed and narrowed down. These changes are reflected in the updated FCC 442 application as well as within the SpaceCap database file.

7) Fill out the NTIA Space Record form. I will email a sample form separately.

The NTIA Space Record form has been filled out for each frequency request in one complete document. It has been submitted as an exhibit to the FCC 442 application, as well as included in the accompanying email response.

8) Submit the SpaceCap file. You should be able to upload this directly to your application under the "Microsoft Access Database" Folder. Correct all the fatal errors in your SpaceCap.

The SpaceCap database for our mission has been submitted as an exhibit to the FCC 442 application, as well as included in the accompanying email response. Our SpaceCap database contains one fatal error, and determined through guidance from the ITU, a note is provided to describe the change of the orbital parameters through the lifetime of the Cesium Mission 1 spacecraft in response to the fatal error regarding our stated minimum altitude.

“For such a situation, you may capture the orbital parameters at the beginning of operation in SpaceCap (550 for apogee and perigee), but indicate 500 for minimum altitude. This will however generate a fatal error from our validation program, so you will need to provide a note with the filing to describe the change of the orbital parameters through the lifetime of the satellite. We will publish the note with the filing.”

This note and validation printout have been submitted as an exhibit to the FCC 442 application, as well as included in the accompanying email response. Please contact me if more information or further action is needed regarding this SpaceCap API database submission.

9) Make sure that the frequency in the SpaceCap matches to that in the form 442.

The SpaceCap database and the FCC 442 application have been reviewed to ensure that the information within each is consistent with one another.

10) If the orbit is Sun Synchronous then provide the LTAN value.

The LTAN value for the mission is 337.5 degrees.

11) Provide a NOAA approval letter for applications that involve imaging.

The NOAA letter stating that no license is required has been submitted as an exhibit to the FCC 442 application and included in the accompanying email response.

12) Provide ITU Cost Recovery letter.

The ITU Cost Recovery letter has been submitted as an exhibit to the FCC 442 application, as well as included in the accompanying email response.

13) Provide Antenna Beam Patterns for earth stations and space stations in Polar format.

The polar formatted antenna beam patterns for both earth stations and space stations are compiled into one document named “CM1 Antenna Beam Patterns”. This document has been submitted as an exhibit to the FCC 442 application, as well as included in the accompanying email response.

Best,

Austin