The Tomorrow Companies Inc.

Form 422 Narrative

Application for New or Modified Radio Station Under Part 5 of the FCC Rules
Experimental Radio Service (Other than Broadcast)

October 30, 2023

The Tomorrow Companies Inc.
9 Channel Center, 7th Floor
Boston, Massachusetts 02210

1. Introduction

The Tomorrow Companies Inc. ("Tomorrow.io") respectfully seeks a conventional experimental radio license to continue use of a ground-based radar calibration transceiver. The ground-based calibrator is currently operating under a six (6) month grant of Special Temporary Authority ("STA") and has been successful so far in calibration and data gathering, specifically in connection with an active Government Contract. The preliminary test results prove our ability to establish calibration links between the spacecraft and ground transceivers, and measurement optimization is currently ongoing to enable accurate characterization of the satellite-based radar transmit gain, receive gain, and antenna pointing accuracy. Tomorrow.io would like to continue experimental operation of the ground-based calibrator to support continued testing of the radar payload in orbit, as Tomorrow-R1 and Tomorrow-R2's mission is to calibrate, validate and test the radar instrument as a testbed for Tomorrow.io's future precipitation radar constellation.

By way of background, Tomorrow.io had initially filed for a six-month authorization under Special Temporary Authority for the ground-based calibrator[1]. This application is seeking authority to continue to operate for two years until November 14, 2025, following expiration of the existing authorization of the ground-based calibrator of November 14, 2023. There have been no material changes to the materials submitted and no changes to the technical operation of the ground-based calibrator.

[1] See File No. 0991-EX-ST-2023, Call Sign WV9XUT, a copy of which is hereby incorporated by reference.

2. Government Contract

Regarding the FCC Form 422, this mission and application is to be used **in part** (but not exclusively) to continue to fulfill the following government contract:

- Program: Commercial Weather Data Pilot – Data Validation and Assimilation for Precipitation Radar Constellation with Technology Readiness Level (TRL) 9
- Agency: United Sates Air Force
- Contract Number: FA873021C0064

3. Background of Tomorrow.io Weather Program

Tomorrow.io, headquartered in Boston, Massachusetts, is a U.S.-based weather technology company on a mission to help countries, businesses, and individuals better manage their weather-related challenges with information and insights – and to democratize access to global weather forecasting. In 2017, two years after Tomorrow.io's founding, the company launched its Weather Intelligence Platform ("Platform"), designed to provide actionable weather insights around the world. While the Platform can ingest weather data from publicly available sources and provide localized weather forecasts catered to the user, a sizeable gap exists in where and how weather is measured. Today, more than seventy-five years after the first weather radar was deployed, it is estimated that 85% of the globe does not have access to reliable forecasting and that five billion people live outside radar coverage, even as more than 70% of businesses are impacted in some way by weather.

To exacerbate the issue, our oceans have little radar coverage, even though most weather systems originate there. These facts contributed to the decision made by Tomorrow.io to develop its weather sensing constellation inaugurated by the development and launch of its experimental spacecraft Tomorrow-R1 and Tomorrow-R2.

For the reasoning as detailed below, Tomorrow.io is requesting a conventional experimental license to continue calibration unit operation.

4. Description of Equipment and Theory of Operation

Tomorrow.io is seeking authority to continue to utilize a ground-based calibrator to aid in testing and calibration of the radar system of its recently launched satellites, Tomorrow-R1 (Call Sign WU9XRY) and Tomorrow-R2 (Call Sign WV9XKQ) at the company's Buzzards Bay, Massachusetts location.

Ground calibrator operation will happen between 8am and 8pm EST and occur only during satellite passes (up to one time per day per each satellite). The total test duration for each occurrence will be roughly 2-3 hours. Ongoing authority to operate the calibrator in coordination with the satellite-based radar systems is critical for accurate assessment of the space system calibration factors, which directly relates to the quality of the precipitation products derived from these radars. To execute calibration testing with a satellite, the ground-based calibrator will transmit, and a link will be established between the ground-based calibrator and the satellites Tomorrow-R1 and Tomorrow-R2, which will also transmit and receive pulses with their radar systems.

The ground-based calibrator is a Ka-band instrument that will operate between 35.5 and 36.0 GHz in a monostatic configuration. Technical parameters for the transceiver are included below:

- Frequency Range: 35.5 GHz-36 GHz
- Peak Power: 17.3 W = 12.4 dBW
- Peak ERP (W): 335
- Modulation: Pulsed Linear Frequency Modulation
- Polarization: Linear
- Emission Designation: 500MM8N

Antenna Information

The ground calibrator includes a horn antenna for transmitting and receiving.

- Width of beam in degrees at the half-power point: 30 degrees E-plane x 36 degrees H-plane
- Orientation in horizontal plane (degrees from True North): N/A - when pointing at zenith there is no definable angle relative to true north.
- Orientation in vertical plane (degrees from horizontal): 90 degrees (pointing at zenith is perpendicular to the horizontal plane)

Testing Location

Location: Tomorrow.io Offices
Latitude: 41° 43’ 47” N
Longitude: 70° 35’ 9'' W
Radius of Operations: Within 2 km of the Location
Address: 1 Technology Park Drive,
Buzzards Bay MA 02532

5. Interference Mitigation and Coexistence

Tomorrow.io is committed to coordination and to collaborative operations of its ground-based calibrator. The calibrator transmissions are for scientific calibration purposes. There are no other associated communications with other ground receiving stations related to this calibration.

6. Coordination

Tomorrow.io will not transmit in any manner that causes unacceptable interference to authorized transmissions of another licensee, and as previously mentioned will maintain complete and accurate technical details of current and planned transmissions to aid in the prompt correction of any potential interference, should it occur.

Stop Buzzer Point of Contact:

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