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Experimental Application to Test Radar Instrumentation

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A. Purpose of Operation and Need for License

The purpose of this application is to request authorization from the FCC for the Remote Sensing Center at The University of Alabama to operate an aircraft-mounted radar system from November 15 of 2021 to March 28 of 2022 (2-4 hours each flight), near the University of Alabama Arboretum and the Talladega National Forest in Alabama, to develop, calibrate and test the radar system and collect radar data on soil moisture in low and high vegetation areas. The objective of the overall project is to collect soil moisture data to improve the national water model (National Oceanic and Atmospheric Administration (NOAA) contract number NA19NES4320002. The radar data will be used to map the soil moisture for estimating the water retained over vegetated areas.

We are requesting operations near the Remote Sensing Center's R&D facilities in Tuscaloosa, AL. We are including nominal operating parameters (frequency and power) and can adjust these parameters to accommodate FCC requirements.

B. Locations of Proposed Operation

The experimental schedule is requested for the development, calibration, and testing of the aircraft-mounted radars prior to semi-operationally deployment. The locations of operation are outlined in Table 1.

Proposed Location	
Area near Tuscaloosa, AL	University of Alabama Arboretum and its surrounding area as shown in Figure 1. Coordinates are provided in section E.1 NSF National Ecological Observatory Network (NEON) site in Talladega National Forest and its surrounding area near Tuscaloosa, Alabama, as shown in Figure 2. Coordinates are provided in section E.2

Table 1 – Summary of Proposed Operation Locations

The operation will be limited to flights lasting two to four hours, between November 15th, 2021 and March 28th, 2022. The transmitter height will be between 1500 and 10000 feet above ground (AGL).

Figure 1 - Proposed Site (University of Alabama Arboretum, Tuscaloosa, AL)

Figure 2 - Proposed Site (NSF NEON site, Talladega National Forest, near Tuscaloosa, AL)

C.Technical Specifications

1. Frequency of Operation

We request authorization to operate from 2.7 – 10.7 GHz. These parameters can be adjusted.

We plan to notch the following frequencies previously requested by the FCC and FAA: 2720-2825 MHz, 3550-3700 MHz, 3800-4200 MHz, 7745-7755 MHz, 8330-8340 MHz.

2. Effective Radiated Power (ERP)

The effective radiated power (ERP) will not exceed 2 W average for 2.7 – 10.7 GHz. These parameters can be adjusted.

3. Modulation Signal Description and Emissions

The emissions are a 2.7 – 10.7 GHz linear Frequency Modulated signal with a sweep time near 200µs with a duty cycle varying from 50% to 100%. These parameters can be adjusted.

4. Antenna Information

The transmit and receive antenna that will be used is an experimental custom-built broadband Vivaldi-type antenna array. The antenna exhibits 16 dBi to 23 dBi of gain across the 2.8-10 GHz band, with a maximum Half Power Beam Width (HPBW) of 23° at 3 GHz and for electrical steering is 22° of North. The antenna will be radiating nadir towards the surface of the earth.

5. Equipment Utilized

Equipment used for this system is custom built at the Remote Sensing Center at the University of Alabama. One unit will be used for each frequency band under this experimental application.

6. Station Class

This station will be Aeronautical Mobile in the areas described in section B, with a nominal altitude of 1500 feet AGL.

D. Contact Information

For questions about this application, please contact:

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E. Appendix

1. Flight Test Area Coordinates

University of Alabama Arboretum extending on radius 2 nautical miles from point coordinates:
N 33° 11’ 42”
W 87° 28’ 54”

2. Flight Test Area Coordinates

NSF NEON site, Talladega National Forest extending on radius 2 nautical miles from point coordinates:
N 32° 57’ 1”
W 87° 23’ 35”