



## **Special Temporary Authority to Test Radar Instrumentation**

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**Form 442, File Number:**

**Jennifer Laverentz**  
**Center for Remote Sensing of Ice Sheets (CReSIS)**  
**University of Kansas, Lawrence, Kansas**  
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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 CReSIS (Center for Remote Sensing of Ice Sheets) at the University of Kansas to operate aircraft-mounted radar systems during 5 to 10 flights (8 hours each flight) between March 6<sup>th</sup>, 2017 and April 13<sup>th</sup>, 2017, around the Fairbanks area in Alaska. In addition, Some of the Arctic sea ice data collection requires that the radar operate within 200 nautical miles (nm) of the U.S. coastline, requiring authorization from the FCC.

The primary objectives of the project are to perform radar measurements as a part of NASA's OIB (Operation ICE Bridge) program over the Arctic and Antarctic sea ice and ice sheets (NASA contract number NNX16AH54G). The radar data are will be used to determine ice thickness and to map both near surface and deep internal layers of ice sheets, as well as to map the snow-air and snow-ice interfaces for estimating the thickness of snow over land and sea ice.

## B. Previously Approved Experimental Special Temporary Authorizations (STA)

CReSIS/KU has been granted the following experimental Special Temporary Authorizations to operate in the same geographic region in the past:

### Experimental Special Temporary Authorization, Call Sign: WF9XMV File number: 0520-EX-ST-2012

- Effective date range: Dec. 14, 2012 to May 14, 2013
- Geographic region: Arctic Management Area (same polygon as being requested in the current STA)
- Frequency Information:
 

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance
2-8 GHz	MO	6G00F3X	1W (ERP)	+/- 0.005%
12-18 GHz	MO	6G00F3X	2.51 W (ERP)	+/- 0.00166667%
- Special conditions (relevant to this geographic region):
  - 2700-2900 MHz must be notched
  - Future operations outside of these areas will require further notching of other frequency bands used by FAA.
  - This radio system shall not be used for functional development beyond the scope of this ice sheet testing.

### Experimental Special Temporary Authorization, Call Sign: WG9XGN File number: 0025-EX-ST-2013

- Effective date range: March 1, 2013 to April 13, 2013
- Geographic region: Arctic Management Area (same polygon as being requested in the current STA)
- Frequency Information:
 

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance
180-210 MHz	MO	30M0Q3N	9048 W (ERP)	none listed
- Special conditions (relevant to this geographic region):
  - Operation is subject to prior coordination with the Society of Broadcast Engineers, Inc.

(SBE); ATTN: Executive Director; 9102 North Meridian Street, Suite 305; Indianapolis, IN 46260; telephone, (866) 632-4222; Fax, (317) 846-9120; e-mail, [executivedir@sbe.org](mailto:executivedir@sbe.org); information, [www.sbe.org](http://www.sbe.org)

**Experimental Special Temporary Authorization, Call Sign: WF9XMU  
File number: 0282-EX-ST-2016**

- Effective date range: March 14, 2016-April 5, 2016
- Geographic region: Arctic Management Area (same polygon as being requested in the current STA)
- Frequency Information:

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance
2-8 GHz	MO	Wj9XMU	1W (ERP)	
12-18 GHz	MO	Wj9XMU	12 W (ERP)	
150-450 MHz	MO	Wj9XMU	500 W (ERP)	

- Special conditions (relevant to this geographic region):
  - 2700-2900 MHz must be notched
  - Future operations outside of these areas will require further notching of other frequency bands used by FAA.
  - This radio system shall not be used for functional development beyond the scope of this ice sheet testing.

### C. Locations of Proposed Operation

An STA is requested to allow the collection of ice data using aircraft-mounted ultra wideband radar and for the calibration and testing of the radar. The height of the transmitter will be at a nominal flight altitude of 1500 feet AGL. The locations of operation are outlined in Table 1.

**Table 1 – Summary of Proposed Operation Locations**

The area of operation in the Fairbanks area are shown in Figure 1. The operation will be limited to between 5 and 10 flights (8 hours each) between March 6<sup>th</sup>, 2017 and April 13<sup>th</sup>, 2017. The exact locations are listed in Appendix 1.

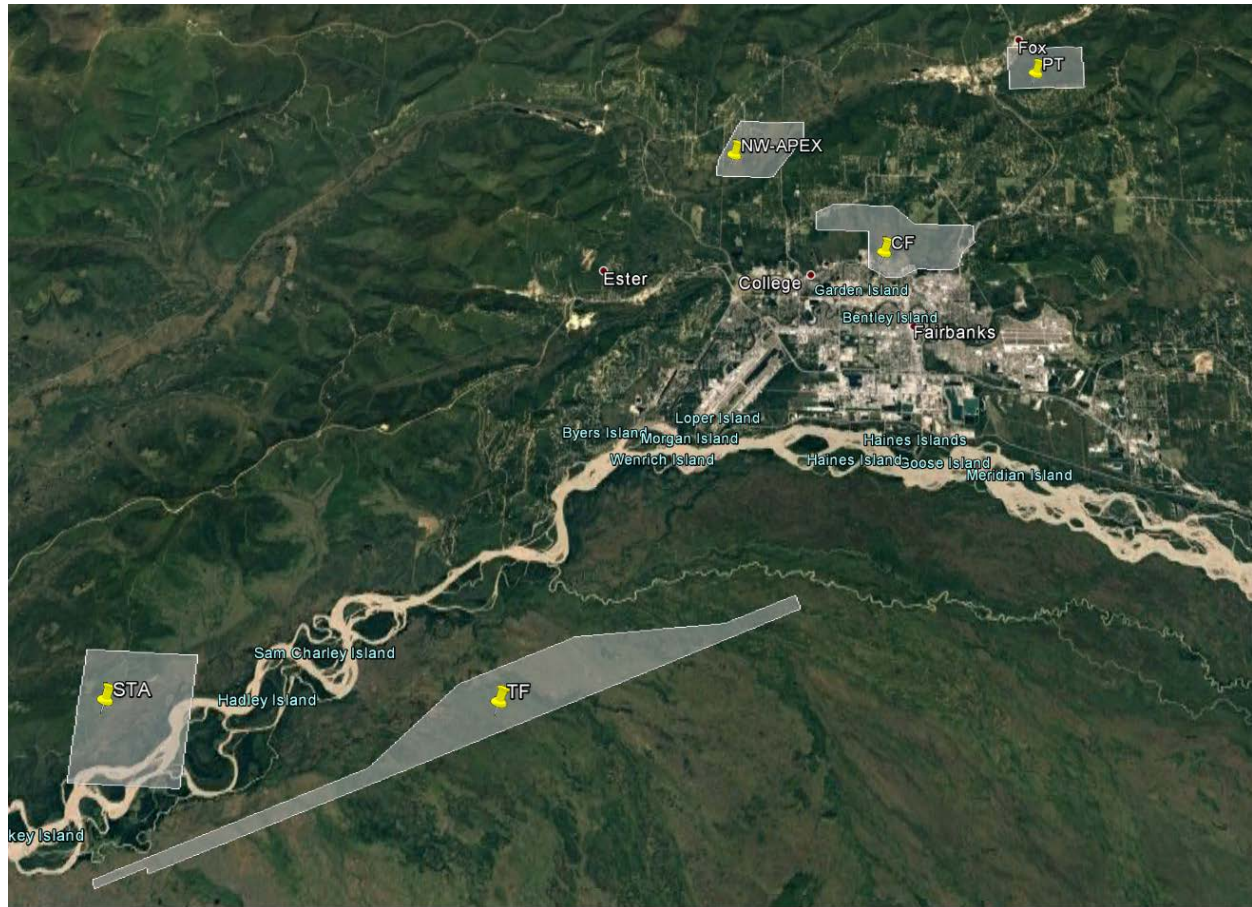


Figure 1

## D. Technical Specifications

### 1. Frequency of Operation

CRISIS requests authorization to operate in 2-18 GHz and 600-900 MHz bands.

### 2. Effective Radiated Power (ERP)

The effective radiated power (ERP) will not exceed 10 W peak for 2-18 GHz.

The effective radiated power (ERP) will not exceed 10 W peak for 550-950 MHz.

### 3. Modulation Signal Description and Emissions

For 2 - 18 GHz, the signal is an FMCW (frequency modulated continuous wave) radar signal with a pulse width of 192  $\mu$ s, duty cycle of 96%, and a pulse repetition frequency of 5 kHz. The primary emission designator is 16G0Q3N for 2 - 18 GHz.

For 600-900 MHz, the signal is a linear FM pulse. Each pulse will be 2  $\mu$ s with a pulse repetition frequency of 20 kHz. The emission designator for this signal is 300MQ3N.

#### 4. Antenna Information

2-18 GHz: The antenna used is an 8 by 16 element Vivaldi array. The antenna exhibits up to 20 dBi of gain with a beamwidth up to 25° in along-track and 50° in cross-track. The antenna broadside is pointed at nadir, toward the surface of the earth.

550-950 MHz: The transmit antenna is a 4 by 2-element dipole array. This configuration produces approximately 12 dB of gain. The beamwidth is 44 degrees in the along-track direction and 22 degrees in the cross-track direction. The antenna broadside is pointed at nadir, toward the surface of the earth.

#### 5. Equipment Utilized

Equipment used for these systems are custom built at CReSIS. One unit will be used for each frequency band under this STA application.

#### 6. Station Class

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

### E. Contact Information

For questions about this application or in the unlikely event interference concerns should arise, please contact:

Jennifer Laverentz  
Center for Remote Sensing of Ice Sheets (CReSIS)  
The University of Kansas  
2335 Irving Hill Rd  
Lawrence, KS 66045  
Telephone: (785) 864-7722  
[jenlav@ku.edu](mailto:jenlav@ku.edu)

### F. Appendix

#### 1. Proposed flight line Coordinates

Below are all the coordinates that make up the areas of the proposed flights.

CF

-147.8	64.876
-147.75	64.876
-147.75	64.862
-147.74	64.858
-147.73	64.858

-147.73 64.858  
 -147.73 64.858  
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 -147.73 64.858  
 -147.73 64.858  
 -147.71 64.862  
 -147.68 64.862  
 -147.68 64.863  
 -147.67 64.869  
 -147.66 64.873  
 -147.66 64.88  
 -147.71 64.88  
 -147.73 64.887  
 -147.78 64.887  
 -147.8 64.883  
 -147.8 64.878  
 -147.8 64.876

**NW-APEX**

-147.84 64.897  
 -147.81 64.915  
 -147.81 64.921  
 -147.87 64.921  
 -147.89 64.904  
 -147.89 64.897  
 -147.84 64.897

**PT**

-147.56 64.956  
 -147.63 64.956  
 -147.63 64.938  
 -147.56 64.938  
 -147.56 64.956

**STA**

-148.35 64.67  
 -148.27 64.669  
 -148.27 64.669  
 -148.27 64.713  
 -148.36 64.713  
 -148.35 64.67

**TF**

-148.32 64.638  
 -148.28 64.645  
 -148.28 64.643  
 -147.81 64.735  
 -147.81 64.74  
 -147.87 64.729  
 -147.98 64.723  
 -148.07 64.706  
 -148.13 64.678  
 -148.32 64.64  
 -148.32 64.638