

Special Temporary Authority to Test Radar Instrumentation

FRN: 0021252267

Form 442, File Number: 0301-EX-ST-2018

**Jennifer Laverentz
Center for Remote Sensing of Ice Sheets (CReSIS)
University of Kansas, Lawrence, Kansas
February 20, 2018**

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 6th, 2017 and April 13th, 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: WF9XVB File number: 0027-EX-ST-2017

- Effective date range: March 6, 2017-April 14, 2017
- 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
2-18 GHz	MO	16G0Q3N	10 W (ERP)	
550-950 MHz	MO	400 MQ3N	10 W (ERP)	

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

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):
 - o 2700-2900 MHz must be notched
 - o Future operations outside of these areas will require further notching of other frequency bands used by FAA.
 - o 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 Alaska are shown in Figure 1. The operation will be limited to between 5 and 10 flights (8 hours each) between March 23th, 2018 and March 30, 2018.

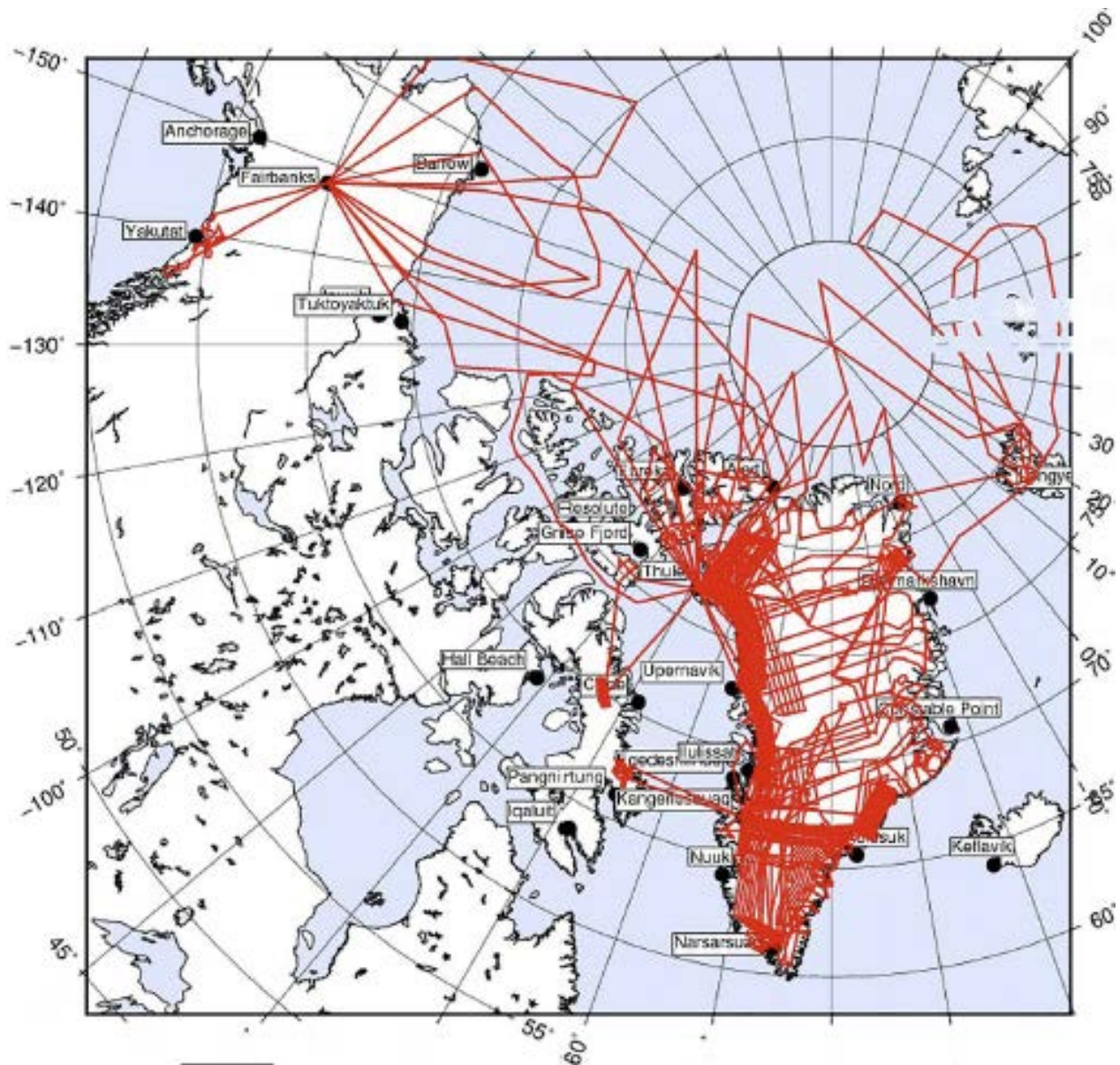


Figure 1 -2018 Spring IceBridge Missions

D. Technical Specifications

1. Frequency of Operation

CRISIS requests authorization to operate in 2-18 GHz and 550-950 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 μ s, duty cycle of 96%, and a pulse repetition frequency of 5 kHz. The primary emission designator is 16G0Q3N for 2 - 18 GHz.

For 550-950 MHz, the signal is a linear FM pulse. Each pulse will be 2 μ s with a pulse repetition frequency of 20 kHz. The emission designator for this signal is 400MQ3N.

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

F. Appendix

1. Proposed flight line Coordinates

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

Sinbloop

Lon_deg	Lat_deg
-147.856	64.815
-166.095	69.0363
-165.92	69.5417
-165.739	70.047
-165.55	70.5522
-165.353	71.0572
-165.148	71.5619
-164.933	72.0665
-164.709	72.5709
-164.473	73.0751
-164.225	73.579
-163.964	74.0827
-163.688	74.5861
-163.397	75.0892
-160.146	76.0024
-158.583	76.003
-157.31	76.373
-155.97	76.7364
-154.558	77.0928
-153.07	77.4416
-151.502	77.7821
-149.997	78.0011
-143.995	78.3639
-140	77
-140.777	75.9841
-141.101	75.4816
-141.405	74.9788
-141.693	74.4756
-141.965	73.9722
-142.223	73.4685
-142.468	72.9645
-142.701	72.4603

-142.924	71.9559
-143.136	71.4512
-143.339	70.9464
-143.534	70.4414
-147.856	64.815

Sisbasin

Lon_deg	Lat_deg
-147.856	64.815
-135.839	69.0093
-135.571	69.4345
-135.252	69.9199
-134.92	70.4049
-134.574	70.8893
-134.212	71.3731
-133.833	71.8563
-133.436	72.3388
-133.019	72.8205
-132.581	73.3015
-132.119	73.7816
-131.633	74.2608
-131.118	74.739
-130.573	75.2161
-129.995	75.6919
-129.38	76.1664
-128.725	76.6394
-128.026	77.1108
-127.276	77.5803
-126.472	78.0478
-125.606	78.513
-124.671	78.9756
-123.658	79.4354
-122.557	79.8918
-121.357	80.3444
-120.044	80.7928
-118.603	81.2361
-117.013	81.6737
-115.253	82.1045
-113.298	82.5275
-111.116	82.9411
-108.671	83.3437
-105.924	83.7331
-102.826	84.1068
-99.3263	84.4615
-95.3704	84.7933
-90.906	85.0977
-63.8	82.75

-68.8 76.53

Alaska Glaciers

Lon_deg	Lat_deg
-147.856	64.815
-137.448	59.2999
-137.2	59.1883
-137	59.0041
-136	58.6
-136	58.35
-136.463	58.2825
-136.599	58.3345
-136.823	58.7002
-136.8	58.879
-136.686	58.8755
-136.501	59.0002
-136.756	59.1473
-136.786	59.3001
-138.903	59.6802
-139.1	59.7219
-139.058	59.7681
-138.929	59.7002
-138.852	59.5248
-138.92	59.4953
-138.61	59.5489
-138.4	59.4191
-138.994	59.7998
-138.874	60.1147
-138.874	60.1147
-138.642	60.0609
-138.414	60.1057
-137.999	60.0884
-137.999	60.282
-138.498	60.3127
-138.798	60.1493
-139.074	60.2554
-139.815	60.6807
-139.531	60.6569
-139.415	60.4001
-139.414	60.4001
-139.284	60.2002
-139.309	60.1001
-139.4	60.0362
-139.583	59.9502
-139.4	60.0362
-139.309	60.1001
-139.262	60.2001

-139.5	60.3826
-139.8	60.4616
-139.91	60.5001
-139.963	60.6002
-140.1	60.7039
-140.101	60.8528
-139.982	60.8002
-139.944	60.7002
-139.95	60.6187
-139.599	60.5257
-139.414	60.4001
-139.284	60.2002
-139.309	60.1001
-139.4	60.0362
-139.583	59.9502
-139.886	60.2195
-139.6	60.151
-139.459	60.1001
-139.4	60.0355
-139.35	59.9963
-139.24	60.0095
-139.125	59.9863
-138.805	60.1001
-138.905	60.116
-139.1	60.1236
-139.262	60.2001
-139.5	60.3826
-139.8	60.4616
-140	60.5393
-140.25	60.7011
-140.99	60.4356
-140.3	60.3769
-140.168	60.3177
-140.409	60.2
-140.603	59.7154
-140.075	59.8047
-140.484	60.0019
-141.104	59.9282
-141.5	60.1359
-141.7	60.1266
-141.87	60.1035
-141.725	60.0688
-141.664	60.0803
-141.58	60.1261
-141.5	60.136
-141.5	60.1453
-141.6	60.177
-141.8	60.1959

-141.965	60.1501
-147.856	64.815

Sichukchiwest

Lon_deg	Lat_deg
-147.856	64.815
-153.538	70.7974
-154.239	71.2187
-154.969	71.6376
-155.73	72.0537
-156.524	72.467
-157.354	72.8773
-158.222	73.2843
-159.13	73.6877
-160.08	74.0874
-161.077	74.4829
-162.122	74.8741
-163.219	75.2605
-164.372	75.6418
-165.584	76.0176
178.934	74.9603
179.991	74.5702
-179.002	74.1755
-178.042	73.7768
-177.124	73.3742
-176.248	72.968
-175.41	72.5584
-174.608	72.1458
-173.839	71.7302
-173.102	71.312
-172.395	70.8912
-171.716	70.468
-171.064	70.0426
-170.436	69.6152
-169.831	69.1858
-169.249	68.7545
-168.688	68.3215
-168.146	67.8869
-167.623	67.4507
-167.117	67.0131
-166.629	66.5741
-147.856	64.815

Siebeufort

Lon_deg	Lat_deg
-147.856	64.815
-139.5	69.4

-126	78.5
-122.588	78.3288
-123.035	77.8286
-123.45	77.3278
-123.836	76.8265
-124.196	76.3247
-124.534	75.8225
-124.851	75.32
-125.15	74.817
-125.433	74.3138
-125.7	73.8102
-125.954	73.3064
-126.195	72.8024
-126.424	72.2981
-126.562	71.9828
-133	71.5
-139	69.4
-147.856	64.815

Sibloop

Lon_deg	Lat_deg
-147.856	64.815
-159	70.9
-149.903	75.0112
-146.916	75.307
-146.599	75.8096
-146.262	76.3118
-145.901	76.8136
-145.516	77.3149
-145.102	77.8157
-141	75
-140.108	73.9998
-140.202	73.8707
-140.457	73.3669
-140.7	72.8629
-140.931	72.3586
-141.151	71.8542
-141.362	71.3495
-141.563	70.8446
-141.756	70.3396
-141.942	69.8344
-147.856	64.815

Silaxon

Lon_deg	Lat_deg
-147.856	64.815
-154.036	71.7967

-154.43	72.2793	-61.2232	83.7575
-154.845	72.7611	-58.4537	83.3691
-155.28	73.2422	-56.881	83.1194
-155.739	73.7225	-68.8	76.53
-156.222	74.2018		
-156.733	74.6801		
-157.274	75.1573		
-157.848	75.6333		
-158.458	76.108		
-159.107	76.5812		
-159.801	77.0528		
-160.448	77.464		
-159.928	77.7637		
-159.1	78.2303		
-158.207	78.6945		
-157.242	79.156		
-156.196	79.6145		
-155.058	80.0694		
-153.815	80.5204		
-152.453	80.9669		
-150.955	81.408		
-149.301	81.843		
-147.467	82.2709		
-145.426	82.6903		
-143.146	83.0998		
-140.587	83.4974		
-137.708	83.881		
-134.458	84.2475		
-130.786	84.5937		
-126.636	84.9152		
-121.96	85.2073		
-116.722	85.4641		
-110.915	85.6795		
-104.575	85.8468		
-100.38	85.9244		
-99.862	85.9297		
-93.2111	85.7981		
-87.0373	85.6144		
-81.4141	85.3847		
-76.3619	85.1157		
-71.8625	84.8134		
-67.8746	84.4833		
-64.3462	84.13		