

MODIFICATION OF EXPERIMENTAL LICENSE AUTHORITY
(CALL SIGN WH2XPS)

On February 26, 2015, the Office of Engineering and Technology (“OET”) granted experimental authority to BlackSky Global, LLC (“BlackSky”) to operate 5 earth stations to communicate with two experimental space stations named Pathfinder-1 and Pathfinder-2. BlackSky requests the instant modification to add an additional earth station to communicate with the Pathfinder 1 and 2 micro satellites.

Expedited treatment is requested for this modification. While the experimental project has been extensively delayed due to delays in the launch of the space stations associated with the earth stations that are the subject of this license, one of the two space stations, Pathfinder-1, is now scheduled for launch on a PSLV rocket on or before mid-August, 2016, and testing of the earth station that is subject to this application is necessary to take place before that launch.

The additional earth station described herein uses an 18.3 meter (60’) parabolic antenna that has a higher gain and will aid in initial satellite acquisition and communication during early operations. The antenna is owned by SRI International (“SRI”) and is used for satellite calibrations, spacecraft command and telemetry, radio astronomy measurements, and weak signal detection and the related diagnosis of spacecraft conditions. After communication with the satellites is established, the station will serve as a backup to address any technical difficulties that may occur during satellite operations.

This modification does not contemplate any changes to the existing technical details of the grant, as relates to power, frequencies, or emissions between either point of communication and the previously-authorized ground station facilities. Only the proposed addition of an earth station is sought and no changes are proposed to the existing operating parameters of the license.

Accordingly, BlackSky submits only those additional technical operating parameters that will be associated with the additional earth station.

Location:

(6) Palo Alto, CA
37° 24’ 11’’ NORTH
122° 10’ 27’’ WEST
SRI Observation Site

Site elevation: 145 m AMSL
Highest point of antenna: 25 m AGL
The closest aircraft landing area is 8 km

Minimum elevation angle: 5°

FAA Notification is not required. The Commission has licensed previous operations using these facilities without requiring FAA notification¹. FAA notification of the antenna is also not required under the FCC's rules as set forth in 47 CFR §17.7. The antenna is not within 8 km (5 miles) of an airport, and is not more than 200 feet in height. Section 17.7 (e)(1) provides that notification to the FAA is not required if the antenna "will be shielded by existing structures of a permanent and substantial nature." The antenna is located within 0.8 km (0.5 miles) of a large 150-foot diameter radio reflector antenna that is known locally as "the Dish." The Dish facilities are of such a large, permanent well known nature, that their proximity to the existing 60 foot dish facilities provide sufficient cover so as not to adversely affect air navigation safety.

Operation:

Pursuant to its operating agreement, BlackSky will control all transmissions from the earth station while SRI will be responsible for the operation and direction of the antenna.

Antenna details:

Manufacturer: SRI International
Model: SRI 60' antenna
Antenna diameter: 18.3 meters (60 feet)

Frequencies:

UHF Tx (uplink) 449.75 – 451.25 MHz.
UHF Rx (downlink): 401-402 MHz

Transmitting Antenna:

Gain: 35 dBi at 401.5 MHz and 450 MHz
Beamwidth: 3.2°
Azimuthal range: 0-360 deg

Power, EIRP, Polarization: 100 W, RF output with 4.5 dB of line loss and 35 dBi of antenna gain results in 80.5 dBm EIRP. Both RHCP and LHCP are available on the antenna and may be used.

¹ See e.g. Planet Labs, Inc., WG2XKW.

Summary of transmissions between earth station and satellites:

	SRI Uplink	SRI Downlink
From:	Ground	Space
To:	Space	Ground
Transmit Power (Watts):	100	2
Frequency, MHz:	450	401.5
Transmit Antenna Gain, dBi:	35	3
Losses to Antenna, dB:	4.5	0.73
Transmitter EIRP, dBm:	80.50	35.28
Slant Range, km:	2198	2198
Path Loss, dB:	152.4	151.4
Polarization Loss, dB:	3	3
Transmit antenna pointing loss, dB:	8.5	1.5
Receive antenna pointing loss, dB:	1.5	8.5
Isotropic signal at Receive antenna, dBm:	-84.90	-129.12
Receive Antenna Gain, dBi:	3	35
Losses to Receiver, dB:	1.72	1
Received Power at LNA input, dBm:	-83.62	-95.12
Receive Noise Figure, dB:	3.5	0.75
Sky Temperature, K:	230	121
System Noise temperature:	548	294
Receiver G/T, dB/K:	-26.11	9.32
Data Rate, bps:	9,600	440000
Receiver Bandwidth, Hz:	40,000	845000
Noise Power, dBm:	-125.19	-114.65
CNR, dB/Hz:	41.57	19.53
Required S/N, dB:	14.8	10.6
Coding Gain, dB :	5.44	5
System Link Margin, dB:	32.21	13.93

24-hour contact details:

BlackSky maintains a 24-hour, 7-day-per-week hotline, which can be reached at the following telephone number: 844-332-3318. Note that this number has been updated. The phone number is BlackSky's on-call number, so it will be a direct line to the on-call operator, and is not tied to a specific individual.

Radiation Hazard Study

The attached radiation hazard study complies with the methods described in the FCC Office of Engineering and Technology's General RF Exposure Guidance, 447498 D01 v05r02. The radiation safety limits used in the analysis are in conformance with Title 47 Chapter I, Subchapter A, Part 1, Subpart I, Section 1.1310.