L3Harris CSW
STA License Attachment
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Description of Special Temporary Authorization License Request

Application Background:

The purpose of this project is to conduct mobile ground/air tests and characterization from an experimental SATCOM system to various satellite constellations in LEO orbits.

Concept of Operations:

The concept of operation is an RF Duplex Link from a SATCOM terminal through the satellite constellation.

For the experiment SATCOM Terminal #1 is a mobile ground terminal located in Salt Lake City, UT. Satellite services will be through Satellite Constellations in LEO orbits via an Electronically Steerable Antenna (AESA) in **Figure 2**. Variable elevation profiles from >30 deg above the horizon will be used to track LEO orbit constellations as the satellites move across the sky (**Figure 1**).

Spectrum Requirements:

Terminal #1 will transmit to the satellite in the 14.0-14.5 GHz frequency ranges while receiving in the 10.7–12.7 GHz frequency ranges. The specific operating frequency bands (sub bands) will be assigned by the satellite provider at the time the experiments are performed. The following satellite provider callsigns will be used for operations:

1. WorldVu (S2963) 14-14.5 GHz

Action Frequency (GHz)	Output Power (dBW)	Output Power (W)	ERP (W)	Mean/Peak	Freq Tolerance (+/-)	Emission Designator	Modulating Signal	Antenna Used
14.0 - 14.5	43.5	22387.2	13645.8	Peak	0.001	2M00D7W	Adaptive Code Modulation	1,3,5,6
14.0 - 14.5	43.5	22387.2	13645.8	Peak	0.001	18M0D7W	Adaptive Code Modulation	1,3,5,6

Multiple waveforms of varying data rate, modulation, and forward error correction will be utilized. The waveform with the largest necessary bandwidth is 18MG1D with a maximum EIRP of 43.5dBW with the power decreasing, depending on the combination of data rate and Es/No.

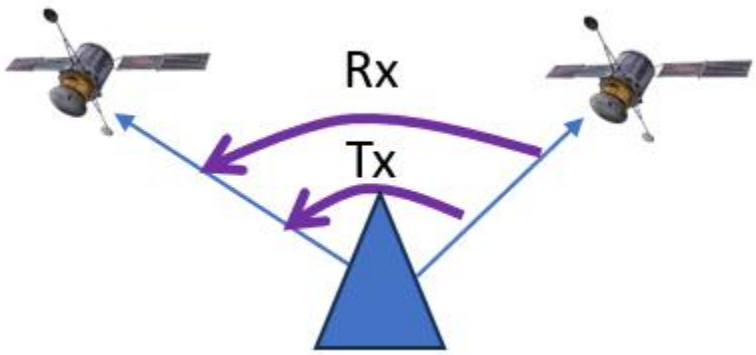


Figure 1: Satellite Elevation profile change

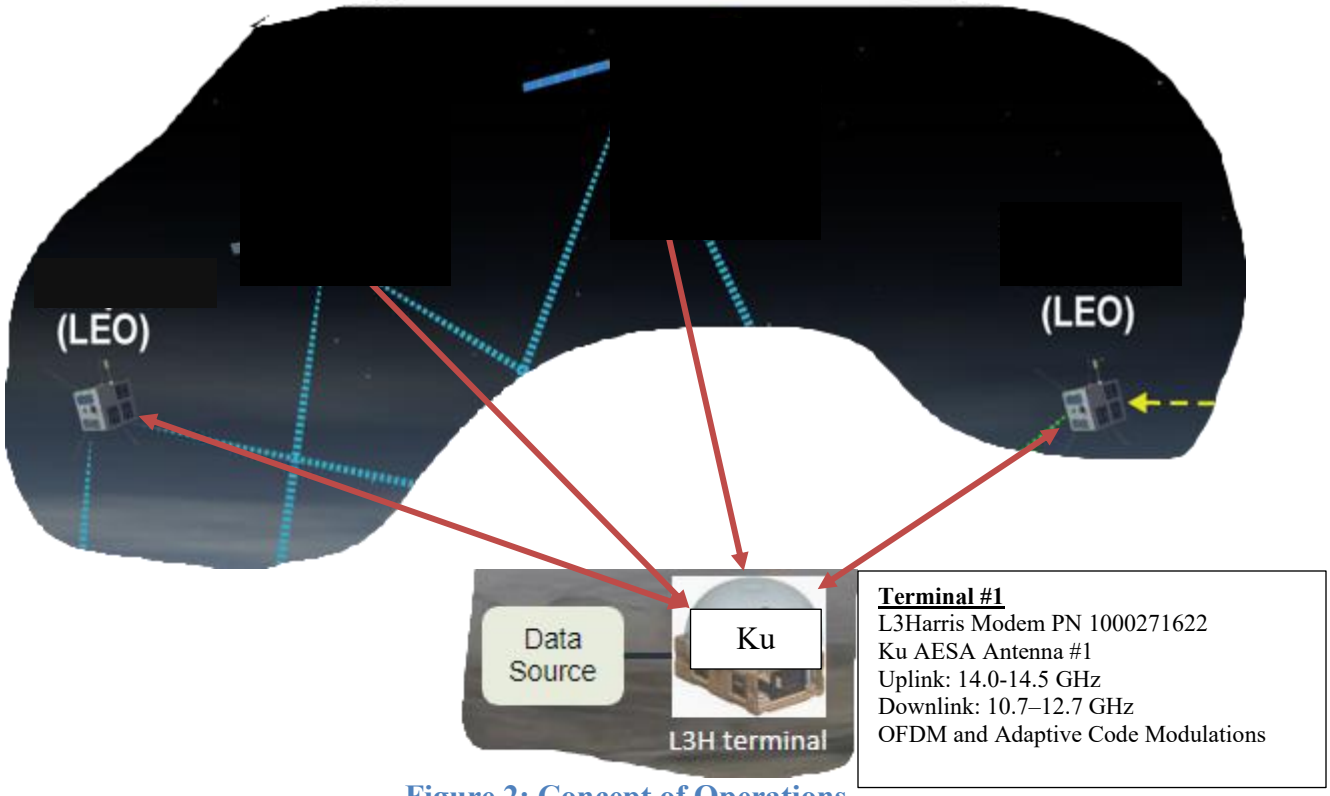


Figure 2: Concept of Operations

Location of Testing:

Terminal #1 is located near Salt Lake City, UT with a rectangular testing path of 174 miles shown in **Figure 3**. Precautions will be taken to avoid any TDRSS stations as well as airport locations during testing.

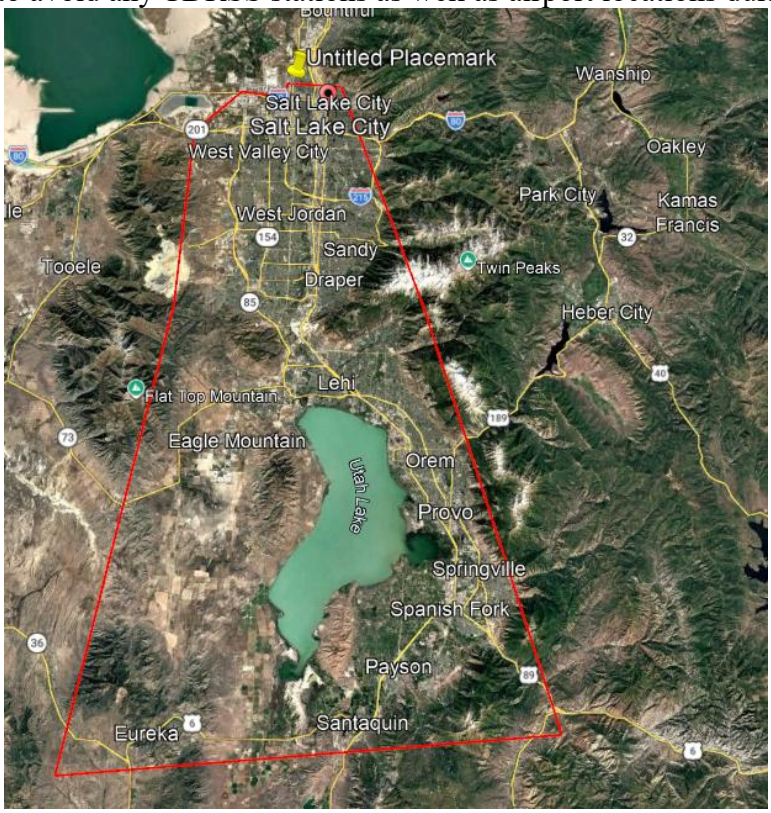


Figure 3: Terminal #1: 40°22'0.89"N, 111°53'34.59"W

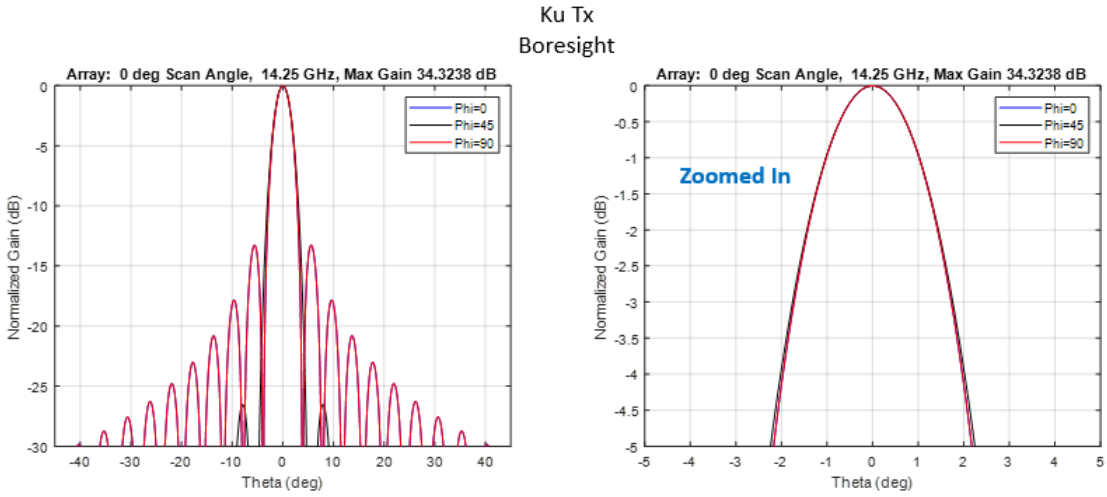
Interference Mitigation

Interference mitigation will be accomplished with the use of RF Tx power control and antenna directivity. Transmit power will be raised slowly until the communication system establishes link and there are zero bit errors. This will minimize the unwanted transmit power exposure and using AESA Antennas the transmit power will be confined to a narrow geographical area further reducing the possibility of interference. 14.47-14.5 GHz and 14.0-14.2 GHz will be avoided during testing of these links if within 125km of any TDRSS stations. The satellite provider will be contacted to receive specific frequencies of operation during testing of duplex links.

Bing Shen will be the Stop Buzzer point of contact: 801-706-0270 | tbing.shen@l3harris.com

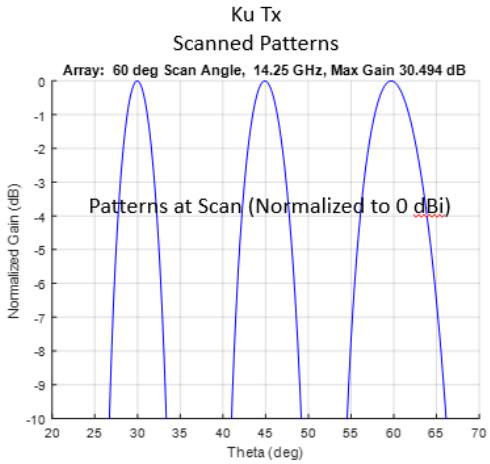
Terminal #1 Ku Tx AESA Antenna #1 PN 1000278026

Max Antenna Gain:	34.3 dB
3 dB Transmit beamwidth:	3.5°
Elevation angle (min):	+30°



Phi=0: 3.4600 deg
Phi=45: 3.5200 deg
Phi=90: 3.4600 deg

Figure 4: Ku Transmit Pattern and Gain



Theta Steer = 30: 3.98 deg
Theta Steer = 45: 4.87 deg
Theta Steer = 60: 6.83 deg

Figure 5: Ku Transmit 3dB Beamwidth at varying Elevation angles