

**L3HARRIS TECHNOLOGIES, INC.
EXPERIMENTAL STA APPLICATION
FILE NO. 1742-EX-ST-2019**

EXHIBIT 1 - DESCRIPTION OF EXPERIMENT

L3Harris Technologies, Inc. ("LHarris") hereby requests experimental Special Temporary Authority ("STA") to operate an experimental X-band ground terminal located in Malabar, Florida to support communications with a LEO earth observation satellite. The proposed ground terminal will provide Telemetry Tracking & Command data to the LEO satellite and will receive Thematic Mapper and sensor data from the LEO satellite.

This request is a re-submission of an STA request originally filed on April 10, 2019 under FCC File No. 0505-EX-ST-2019¹ which was ultimately dismissed without prejudice by the Commission on August 6, 2019 pursuant to the following reasons:

"You are advised that the Commission is unable to grant your application for the facilities requested. The requested band is allocated exclusively for Military Satellite Systems per Footnote G117 and is heavily used by DoD for Satellite Communications (SATCOM)."

NTIA requests Harris Corporation pre-coordinate future STA submissions with the Air Force (POC: Jimmy Nguyen, Email: Jimmy.Nguyen@us.af.mil) and US Navy (POC: Darren Townsend Email: darren.townsend@navy.mil) to develop testing parameters/conditions that, will meet Harris Corporation's test objectives and minimize the impact to SATCOM operations."

L3Harris has successfully pre-coordinated this instant STA request with both the US Air Force and US Navy. Operations under this STA will be subject to the following conditions as issued pursuant to the pre-coordination:

Conditions for L3Harris STA:

- Maximum transmit power into the antenna: -11.6 dBW
- Antenna gain= 49 dBi
- Maximum transmit EIRP: 37.4 dBW (-11.6 dBW + 49 dBi)
- Bandwidth= 15.625 MHz
- Uplink Transmission Restrictions:
 - Terminal will not transmit when pointed within +/- 5 degrees of the GSO belt
 - Terminal will not transmit when pointed within 1 degree of the following specific victim GSO satellites with inclinations greater than 5 degrees:

NORAD Catalog Number	GSO Longitude	Inclination
27875	42.5W	5.3
27691	130W	6.1
23628	104E	11.1
26575	134E	7.4
26052	180	7.9
25019	112W	9.9
26695	34W	9.7
25639	6E	10.7
20776	33E	14

¹ File No. 0505-EX-ST-2019 was originally filed under the applicant Harris Corporation which has since undergone a name change to L3Harris Technologies, Inc.

Conditions for L3Harris STA cont.:

- The above uplink EIRP restriction of 37.4 dBW applies at all times (e.g., even if the pointing angle between the main beam of the subject terminal and the victim GSO satellite is greater than 1 degree).
- These conditions only apply for a transmit earth station with a main beam gain of 49 dBi (4.2m aperture). Other antenna configurations will require additional coordination.

The terminal will consist of a Comtech T242XR, 4.2M carbon fiber parabolic reflector, with a circularly polarized feed, mounted on an XY positioner capable of pointing at any elevation 10 degrees above the horizon at any azimuth.

L3Harris will not cause harmful interference to any stations operating in accordance with the Table of Frequency Allocations and will use its best efforts to avoid and mitigate any issues that may arise.

Because the equipment is technically incapable of providing station identification, L3Harris respectfully requests a waiver of the station identification provisions of Section 5.115 of the Commission's rules, 47 C.F.R. § 5.115.

All network traffic will be simulated traffic only, solely for evaluation purposes and not for the purpose of providing network data communications services to user stations.

L3Harris submits that a grant of this STA request is necessary and in the public interest as it is anticipated that it will lead to commercial sensor improvements for earth sensing.

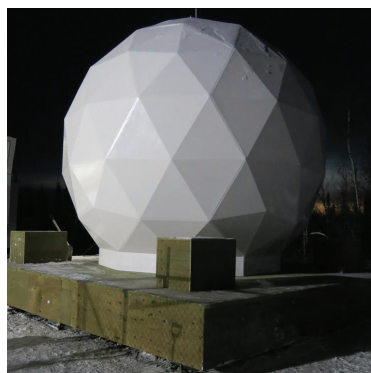
The **stop buzzer contact** for this project is Kim Singleton – Satellite Operations Manager (Mobile: 321-446-2262), and an alternative stop buzzer contact is Rod Nelson - Chief Engineer (Mobile: 321-544-6477), e-mail: gnelso03@L3harris.com.



Low/Medium Earth Orbit Satellite Tracking Antenna Systems

Cost-Effective | Precision Tracking | Unlimited Configuration Flexibility

X/Y Antenna Pedestal Technology



Fixed and Deployable Systems and Radomes

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Comtech Introduction

Comtech Space & Component Technology has developed a cost-effective X/Y antenna pedestal technology that specializes in precision antenna tracking. Our systems are specifically designed for low and medium earth orbits that support Remote Sensing, Earth Observation, and TT&C applications.

We offer a range of X/Y tracking antennas from 30 centimeters to 11 meters coupled with our installation expertise and worldwide support in extreme environments such as the Arctic, Middle East and Tropics. Comtech Space & Component Technology provides the customer a complete satellite and tracking solution for your ground stations.



Type 1 Deployable with non-ground penetrating mount



Type 1 on a platform



Type 2 ground mount

Features:

- 30 centimeters to 11 meters antenna size
- X/Y axis configuration (Series A through Type 6 for increasingly larger dishes)
- Transmit/receive feed technologies through V-band
- Designed for tracking LEO, MEO, HEO and GEO spacecraft
- Applications include Earth Observation, Remote Sensing, Communications and TT&C functions
- Lights-out operation, including ethernet (TCP/IP) and M&C software is provided with Linux-based M&C system, includes SNMP and XML support
- Program and Auto Track Performance
 - Effective program track capabilities that utilize ephemeris data in the form of Two Line Element (TLE) data and other formats
 - Autotrack Capabilities:
 - » Low loss mode coupler tracking system for high frequencies and larger aperture antennas that does not affect G/T performance
 - » Software assisted autotrack - the low velocity tracking dynamic of the X/Y allows the implementation of real time signal level peaking throughout the track by utilizing unique tracking algorithms to control the servo control system

Radome Options:

The Comtech X/Y Antenna Systems do not require a radome for operation, but for extreme locations Comtech can provide a cost-effective radome solution. A radome offers many advantages like protection from extreme weather conditions, extension of component life and provides antenna position concealment.

- Radome Diameter Sizes: 1.5 meters to 20 meters (larger on request) tuned for the frequency or frequencies of interest
- Foam Core Sandwich Composition – three types of construction
 - 'A' sandwich consisting of three layers
 - 'C' sandwich consisting of five layers
 - 'S' space frame design using a fiberglass framing with a reinforced PTFE-impregnated glass fiber (Teflon) fabric (ideal for wideband applications)
- Wind Speed: Radomes capable of surviving in winds up to 200 km/hr – 300 km/hr (depending on specific model)



Antenna in 5m radome with integrated ring wall

Additional Features & Options:

- Deployable, trailer, truck and skid mounts
- High-performance shaped Cassegrain feed configurations
- Multi-frequency feed systems
- Highly-responsive installation and maintenance services
- Full RF and data chain including:
 - » Frequency converters, spectrum analyzers, RF switching, demodulators/modems, uplink amplifiers
- Mode coupler auto-track and software RSSI auto-track (ideal for X/Y low dynamic)



Type 1 on trailer mount



Type A Micro Deployable



Type 5 ground mount



Deployable with breakaway X/Y mount

X/Y System Advantages:

Cost Advantage: Simplified and elegant design, advanced manufacturing techniques, and use of commercial components makes the X/Y one of the most cost-effective antenna products available in the industry

High Performance:

- System **eliminates the “keyhole” at zenith** or “cone of silence” associated with overhead passes experienced on other pedestal configurations
- **Less dynamic tracking motion** of the X/Y antenna over an El/Az provides for **more accurate pointing**, which is especially important when tracking Ka-band
- Low dynamic of movement greatly **reduces system wear**, thus extending the system life and reducing maintenance
- **No cable wrap issues**; no need for rotary joints or slip rings
- Precision gear assemblies **eliminate drive-system backlash**

Delivery: 14 to 26 weeks (ARO) for the 1st system, delivery schedules will vary based on system requirements, antenna size and factory loading at the time of the order. Some X/Y positioner stock is maintained on the shelf and ready for delivery, please inquire.

Carbon Fiber Reflectors: No need to heat the dish to avoid expansion and contraction as temperatures change; greater gain performance over an aluminum dish, especially at the higher Ka-band through V-band ranges. Heated reflectors for ice and snow removal are available.

Environmental Resilience: System designed for operation in coastal, arctic, and desert environments.



Type 5 on a tower

Mechanical				
Specifications	Pedestal <i>Weight (lbs) Height (ft/in)</i>	Dish Sizes	Pedestal <i>Weight (lbs) Height (ft/In)</i>	Dish Sizes
Apertures sizes:	Series A <i>(45lbs)</i>	30cm to 50cm	Type 3 <i>(2,700lbs) (9'10"-14'9")</i>	3.5m—5.5m (Outdoor System) 6.1m (In-Radome System)
	Series B <i>(90lbs)</i>	80cm to 1.2m		
	Series C <i>(165lbs)</i>	1.4m to 1.8m	Type 4 <i>(3,850lbs) (9'10"-14'9")</i>	5.0m (In-Radome System)
	Type 1 <i>(725lbs) (72" to 94")</i>	1.8m—3.4m (Outdoor System) 3.7m (In-Radome)	Type 5 <i>(5,500lbs) (14'9"-20')</i>	5.0m—7.3m (Outdoor System) 7.6m—9.0m (In-Radome System)
	Type 2 <i>(2,200lbs) (9'10" - 12'2")</i>	3.0m—3.7m (Outdoor System) 4.2m—4.5m (In-Radome)	Type 6 <i>(12,500lbs)</i>	7.6m—9.0m (Outdoor System) 8.0m—11.0m (In-Radome System)
Point Accuracy	0.1° to 0.05° (configuration dependent)			
Position Step Resolution	0.0004°			
Acceleration	10°/S² max			
Velocity	5°/s typical to 20°max (note X/Y configuration only requires a fraction of the velocity that would be required with a typical El/Az configuration)			
Axis Configuration	X over Y geometry			
Axis Travel	Full hemispheric coverage			
Horizon Limits	-1° typical			
RF				
Frequency Ranges	L, S, X, C, Ku, Ka, Q and V bands			
Polarization	Left Hand and/or Right Hand Circular Polarization (linear on request)			
Feed Configurations	Multi-band prime focus and/or Cassegrain configuration			
Autotrack feed options	Mode-coupler mono-pulse or RSSI software tracking			
G/T Performance Samples ^[1]	2.4-meter S-band 10.7dB/K Prime focus feed 3.0-meter X-band 24.0dB/K Prime focus feed 3.7-meter X-band 27.5dB/K Cassegrain feed 4.2-meter S-band 16.0dB/K Prime focus feed 5.0-meter X-band 29.5 dB/K Cassegrain feed 5.5-meter X-band 30.2dB/K Cassegrain feed 6.1-meter X-band 31.0dB/K Cassegrain feed 7.3-meter X-band 32.6dB/K Cassegrain feed			
Control System				
Monitor & Control	Full Linux based, includes satellite scheduler and TLE propagator.			
Interface	1Gig Ethernet (TCP/IP) (fiber optic interface can be provided), includes SMNP and XML modules			
Power	100/240Vac, 1phase, 15~30A; Types 5 and 6 require 3-phase 208VAC or 380/415VAC			
Environmental (without Radome)				
Wind Speed	80km—100km/hr wind (62 mph) Operational ^{[2] [3]} 200 km/hr wind (124 mph) Survivable			
Temperature	-40°C—+70°C (-40°F - +158°F)			
Humidity	100% Relative Humidity			
Driving rain	Up to 10cm/hr (4 in/hr)			

[1] G/T Performance at 5° elevation clear sky

[2] Optional measures (heaters, radomes, HVACs) can be taken to improve operational environmental limits

[3] Depends on pedestal/antenna combination

Contact

Space & Component Technology

6181 Chip Ave.
Cypress, CA 90630 USA
Toll Free: 1.866.264.0793
www.trackmysat.com

About Comtech

Comtech Telecommunications Corp. (Nasdaq: CMTL) designs, develops, produces and markets innovative products, systems and services for advanced communications solutions. The Company sells products to a diverse customer base in the global commercial and government communications markets. For more information visit www.comtechtel.com.

Comtech Telecommunications Corp.

275 West Street
Annapolis, MD 21401 USA
Toll Free: 1.800.557.5869
Outside US: +1.410.263.7616
www.comtech-cct.com