



Narrative:

The project objective is to design, build, and test a vehicle mounted mobile multiple aperture antenna system.

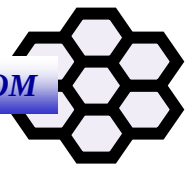
- **Receive apertures are combined** continuously to improve the received signal.
- One and only one of several apertures is selected for transmission at any one time. **Transmit apertures are selected** to optimize the transmit performance. Sub-meter apertures will be used and spectral spreading will be used to ensure compliance with FCC rules for off-axis power spectral density.

Off-the-shelf and previously FCC licensed antennas will be used.

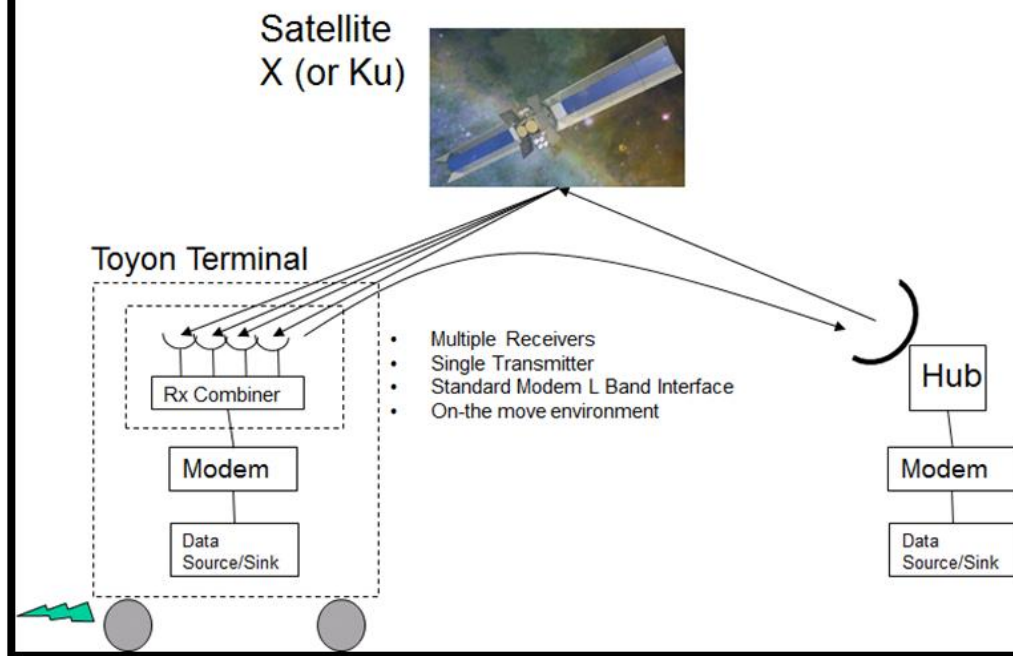
An experimental license is requested since the project is for a limited duration , is for a unique configuration, and is on the move.

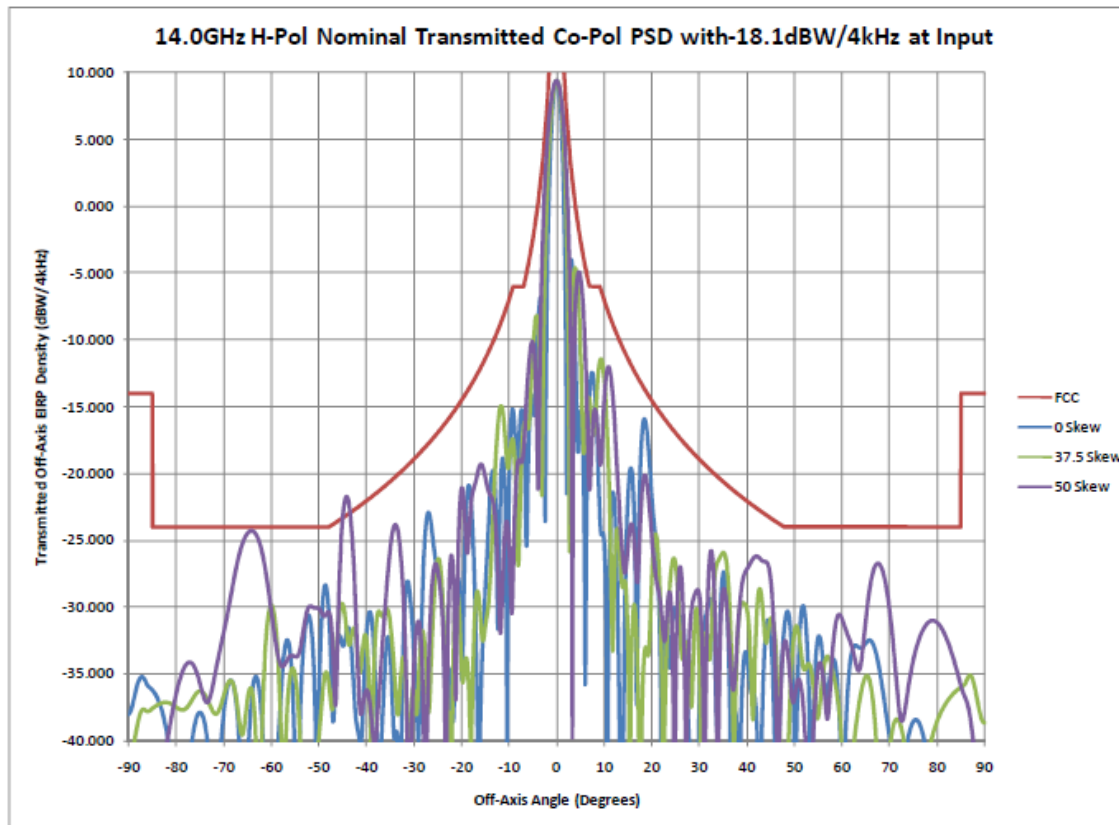
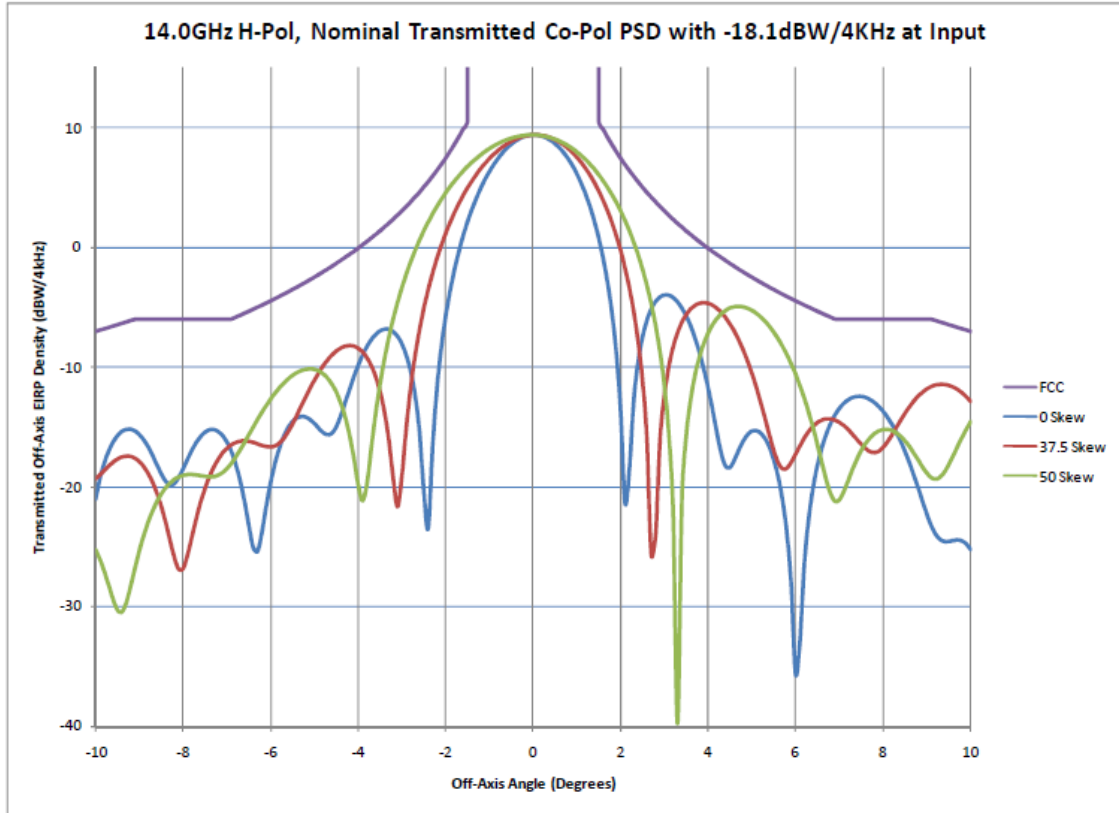
Four Raysat 3000/20 transmit/receive terminals will be used as the mobile terminal. This terminal has previously been licensed by the FCC under call sign E060451 (type Remote 2) (SES-MFS-20120517-00449). The manufacturer's brochure is included below. Sample PSD patterns are shown below. A full set of gain and PSD plots has been filed with the FCC per call sign E060451.

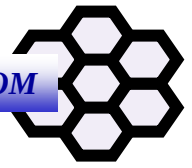
The hub antenna will be a 3.8m GD/Prodelin 1385 series antenna. The brochure for the antenna is included below.



Over-The-Air System Evaluation



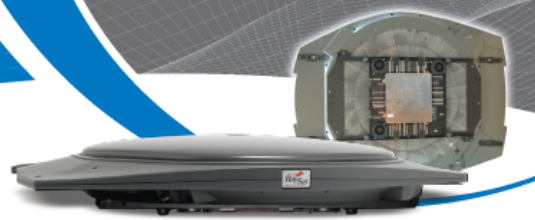




StealthRay™ 3000/20

techSpec

2-way low-profile in-motion satellite antenna with an integrated extremely thin 20W BUC and enhanced performance panel technology



➤ Physical	Outdoor unit size	115 L x 90 W x 18 H cm (45 x 35 x 7 in)
	Outdoor unit weight	35 kg (77 lb)
	Indoor unit size	18 L x 23 W x 7 H cm (7 x 9 x 3 in)
	Indoor unit weight	1 kg (2 lb)
(The radome is included in all measurements and dimensions)		
➤ Electrical	Frequency band	
	Receive	High band 11.7 - 12.75 GHz Low band 10.95 - 11.7 GHz (Factory option, specify upon order)
	Transmit	14.0 - 14.5 GHz
	Polarization	Linear (auto polarization control)
	Gain	
	Receive	29.5 dBi
	Transmit	26 dBi
	Antenna G/T	9 dB/K
	Uplink EIRP	39 dBW
	FCC Compliance	Operationally licensed
	Cross polarization	> 30dB
	IF input/output	950 - 2150 MHz
➤ Antenna Performance	Power supply	10 - 30 VDC (ant.), 48 VDC or 10 - 40 VDC (BUC)
	Continuous power consumption	55 W (ant.) + 180W (BUC)
	Elevation look angle range	Automatically adjusted, 25° - 70°
	Azimuth angle range	Automatically adjusted, 360° continuous
	Tracking rate	60°/sec
	Polarization angle range	Automatically adjusted, -180° to +180°
	Initial satellite acquisition & lock	< 60 sec, fully automated with integrated GPS
	Satellite re-acquisition	< 1 sec, modem dependent
➤ Electrical Interfaces	Azimuth tracking accuracy	0.7° @ 60°/s, 360°/s ²
	Elevation tracking accuracy	0.5° @ 45°/s, 180°/s ²
	Tx, RX and control	TNC, 50Ω
➤ Environmental	Temperature range	-25° to +55°C (-13° to +130°F)
	Relative humidity	10 - 100% condensing
	Ground speed	Up to 350 Km/h (220 mi/h)
	Flammability	UL 94, V0

About RAS

RaySat Antenna Systems (RAS), LLC is part of the RaySat™ family of companies. With RaySat being a leading and award-winning developer, manufacturer and supplier of in-motion low-profile, 1-way phased-array satellite antennas, RAS specializes in the development, marketing, sales and support of in-motion, low-profile, 2-way antenna systems. RAS's low-profile, in-motion, 2-way antennas are specifically designed for the needs of Satcom-On-The-Move (SOTM), mobile emergency communications, home land security (HLS), search & rescue, governmental organizations, DSN, private security, asset tracking, research & exploratory and general mobile satellite data communications. RAS offers consulting and R&D services to clients requiring custom technology solutions. Staffed by over 150 professionals, spanning three continents, RAS's management, sales and support staff are headquartered in Vienna, VA. Additional facilities, including R&D and sales offices are located in Europe and Asia. RaySat, Inc. was established in 1997 and RAS was created in 2006.



RAS, LLC 8460-D-Tyco Rd. Vienna, VA 22182, USA Tel: +1-800-561-9280, Fax: +1-703-584-3775
To contact RAS International Sales & Marketing Team email sales@raasys.com • www.raasys.com



TRANSMIT / RECEIVE ~ NEW SERIES 1385 ~ 3.8m VSAT ANTENNA



Key Features

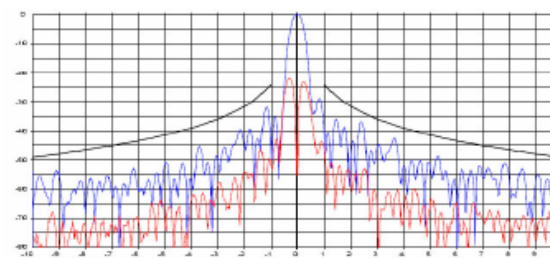
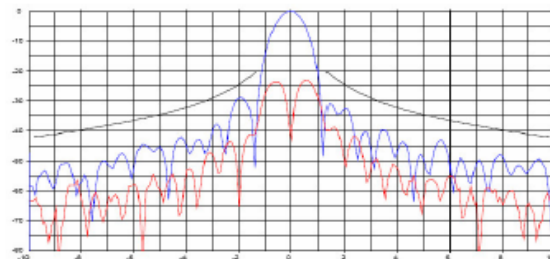
- UPGRADED INTEGRAL RIB DESIGN FOR HIGHER FREQUENCY OPERATION.
- INCREASED STRENGTH FOR HEAVIER RADIO AND ODU EQUIPMENT LOADS.
- HIGHER PRECISION ASSEMBLY AND ALIGNMENT FROM AUTOMATED MANUFACTURING PROCESSES.
- FIELD FRIENDLY INSTALLATION WITHOUT REQUIREMENT FOR SPECIALIZED TOOLS.
- ANTI-ICE CAPABILITY FOR USE IN COLD CLIMATE AND ARCTIC ENVIRONMENTAL CONDITIONS.
- OPTIMIZED, 4-PIECE REFLECTOR DESIGN FOR MAXIMUM SHIPPING EFFICIENCIES.
- UPGRADABLE FOR HIGH XPD PERFORMANCE.

Description

The General Dynamics new series 1385 ~ 3.8m antenna has been designed to provide a reliable, long-life and trouble free antenna solution for demanding applications in the primary VSAT communications bands. Enhancements to this antenna design have improved the structural stability and surface tolerances of the reflector, offering growth potential for reliable communications up to Ka-band.

The antenna has been designed to meet the performance requirements of the major satellite service providers and regulatory agencies.

The mechanical design has been optimized for high efficiency packaging to reduce shipping costs. Material selections for the reflector significantly reduce the risk for shipping damage when compared to metal reflector solutions. Factory pre-assembly of critical components eliminates the requirement for complex assembly procedures in the field.



GENERAL DYNAMICS
SATCOM Technologies

Tx/Rx Multi-band 3.8M VSAT Antenna

Series 1385

Technical Specifications

Electrical		C-Band Linear	C-Band Circular	Ku-Band Linear	X-Band Circular
Antenna Size		3.8 M	3.8 M	3.8 M	3.8 M
Operating Frequency (GHz)	Receive Transmit	3.625 - 4.20 GHz 5.845 - 6.425 GHz	3.625 - 4.20 GHz 5.845 - 6.425 GHz	10.95 - 12.75 GHz 13.75 - 14.50 GHz	7.25 - 7.75 GHz 7.90 - 8.40 GHz
Midband Gain (+/- .2dB)	Receive Transmit	42.00 dBi 46.50 dBi	41.80 dBi 46.30 dBi	51.20 dBi 53.00 dBi	47.80 dBi 48.40 dBi
VSWR	Receive Transmit	1.3:1 Max.($<$ -17.70 dB) 1.3:1 Max.($<$ -17.70 dB)	1.3:1 Max.($<$ -17.70 dB) 1.3:1 Max.($<$ -17.70 dB)	1.5:1 Max.($<$ -14.00 dB) 1.3:1 Max.($<$ -17.70 dB)	1.3:1 Max.($<$ -17.70 dB) 1.3:1 Max.($<$ -17.70 dB)
Pattern Beamwidth (in degrees at midband)	-3 dB -15 dB	Rx 1.40 deg Tx 0.90 deg Rx 3.20 deg Tx 2.00 deg	Rx 1.40 deg Tx 0.90 deg Rx 1.40 deg Tx 0.90 deg	Rx 0.50 deg Tx 0.40 deg Rx 1.00 deg Tx 0.90 deg	Rx 0.80 deg Tx 0.70 deg Rx 1.60 deg Tx 1.50 deg
Sidelobe Envelope, Co-Pol (dBi) 1° $\leq$ θ $\leq$ 20° 20° $<$ θ $\leq$ 26.3° 26.3° $<$ θ $\leq$ 48° 48° θ $<$ 180°		29 - 25 Log θ dBi (Note) -3.5 dBi 32 - 25 Log θ dBi -10 dBi (averaged)	29 - 25 Log θ dBi (Note) -3.5 dBi 32 - 25 Log θ dBi -10 dBi (averaged)	29 - 25 Log θ dBi (Note) -3.5 dBi 32 - 25 Log θ dBi -10 dBi (averaged)	29 - 25 Log θ dBi (Note) -3.5 dBi 32 - 25 Log θ dBi -10 dBi (averaged)
Note: In receive portion of C-band only, sidelobe envelope specified from 100 λ /D rather than 1°					
Antenna Noise Temperature 5° Elevation 10° Elevation 20° Elevation 40° Elevation		55 K 45 K 38 K 36 K	62 K 52 K 45 K 43 K	70 K 60 K 55 K 45 K	60 K 51 K 47 K 47 K
Power Handling		1 kW	1 kW	100 W	2 kW
Cross Polarization Isolation On Axis Within 1.0 dB Beamwidth		$>$ 30 dB $>$ 27 dB	Rx $>$ 15.00 dB Tx $>$ 17.70 dB Rx $>$ 15.00 dB Tx $>$ 17.70 dB	Rx $>$ 30.00 dB Tx $>$ 35.00 dB Rx $>$ 25.00 dB Tx $>$ 26.00 dB	Rx $>$ 23.20 dB Tx $>$ 18.80 dB Rx $>$ 23.20 dB Tx $>$ 18.80 dB
Note: Standard C-band Circular polarization in Tx-Band provides an axial ratio of 1.3 (XPD equivalence of 17.7 dB). Optional F-1 station feedavailable with axial ratio of 1.09 (XPD equivalence $>$ 27.3 dB) in Tx band. Call factory when specifying this option. X Band filters available upon request.					
Output Waveguide Interface Range	Receive Transmit	CPR 229 F CPR 137 or Type N	CPR 229 F CPR 137 or Type N	WR 75 WR 75	WR 112 WR 112
Mechanical					
Reflector Material			Glass Fiber Reinforced Polyester SMC		
Antenna Optics			Easy-to-assemble, 4 Pc., Offset Fed Prime Focus Design with 0.6 F/D optics.		
Mast Pipe Size			10" SCH 40 Pipe (10.75" OD) 27.3 cm.		
Elevation Adjustment Range			12° to 90° or 0° to 15° for Polar Latitudes		
Azimuth Adjustment Range			360° Continuous with +/- .35° Fine Adjustment		
Shipping Specifications		Approx. Net Weight Approx. Packaged Weight	Weight (nominal) 1125 lbs. (511 Kg.) Weight (nominal) 1882 lbs., (855 Kg.)		
Environmental Performance					
Wind Loading		Operational Survival	50 mph (80 km/h) 125 mph (201 km/h)		
Temperature Range (operational)			-40° to 140° F (-40° to 60° C)		
Rain (operational)			½" (13mm) per hour		
Ice (operational)			-----		
Atmospheric Conditions			Salt, Pollutants and Contaminants as Encountered in Coastal and Industrial Areas		
Relative Humidity			0 to 100% Condensing		
Solar Radiation			360 BTU/h/ft2		

GENERAL DYNAMICS SATCOM Technologies

1500 Prodelin Drive • Newton, NC 28658 USA • Telephone: +1-828-464-4141 • Fax: +1-828-464-4147
Email: vsat@gdsatcom.com • Web Site: www.gdsatcom.com

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