SECURITY SUMMARY & SPECIAL HANDLING REQUIREMENTS

The Application Title is : ORCA CubeSat

The System Name is : ORCA CubeSat

The overall classification of this application is : **UNCLASSIFIED**

Refer to your Security Manual for further guidance.

The Application Level Special Handling is : A

Approved for public release; distribution is unlimited (DoD Directive 5230.24)

DOWNGRADING INSTRUCTIONS

Special Handling Instruction : A

J/F 12/11595

CLASSIFICATION

UNCLASSIFIED

FULL RECORD PRINT FOR ORCA CUBESAT

SELECTED FREQUENCIES

(U) 1616.250 MHz
(U) 2217.000 MHz
(U) 8050.000 MHz

Application Title
(U) ORCA CubeSat

System Name (Nomenclature) (U) ORCA CubeSat	**Stage** (U) 4 - Operational
Coord. ID/Coord. Num. J/F 12/11595	**NTIA Certified** (U) No
Agency (U) AF - Department of the Air Force	**Date Of Import** 5/13/2019 1:46:18 PM (GMT)
Overall Security Unclassified	**Date/Time Last Mod.** 4/10/2020 5:59:45 PM (GMT)
Control Numbers:	**Predefined Trunking?** (U) No

SYSTEM INFORMATION

System Description:
(U) ORCA-1 is a DARPA project for Space-Research/RF Monitoring of Earth Transmitters (Earth Operations) and is the first in a series of identical Satellites to be Launched (i.e. ORCA-1, ORCA-2, ORCA-3, etc..). Each Spacecraft will operate in a similar manner regardless of the number of spacecraft in each launch with Early Operations during which satellite checkout and deployment of structures will occur, followed by nominal operations.

System Relationship and Essentiality:
(U) To support the Operations of the ORCA and SHFT CubeSat Constellation utilizing the KSAT-Lite global ground station network.

ATTACHMENTS

File Name	SPS Number	Date of Attachment
(U) Compliance Check Results for ORCA Satellite_16April2019.doc		

TARGET DATES

System Termination: (U) 7/8/2020 **System Activation:** (U) 7/8/2019 **System Approval:** (U) 4/30/2019

NSEP Use: (U) No	**ITU Waiver:** (U) Yes
Number Of Units: (U) 7	**National Coord. Required?** Yes
Num. Units in Same Environment: (U) 7	
Estimated Cost of the System: (U) $ 1300000	

Replacement Information:

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(U) N/A

Remark(s) (U)

(U) All TT&C activities will be taking place from one of three OCONUS Commercial Ground Stations (KSAT). AFRL/DARPA will provide KSAT with a "Script" of how they want ORCA activities ran each day, and KSAT will execute.

Punta Arenas, Chile (52 56'6"S 70 52'14"W)
Awarua Station, New Zealand (46 31'44"S 168 22'49"E)
Hartebeesthoek, South Africa (25 53'8"S 27 42'20"E)

(U) LOCATION Information: APOGEE and PERIGEE listed as 500Km, but with an estimated +/- Location of 25Km. .

(U) Referencing SPS 22496/1 and AFRL's use of a Commercial Satellite/Ground-based assets (GlobalStar) in conjunction with an AFRL space-based asset, request Section 7.23 of the NTIA Manual apply to support this program and is as follows: Federal Government entities may, without further authority from the Assistant Secretary of Commerce for Communications and Information, operate radio devices as end users in commercial FCC-licensed systems in the services listed below. Operation of end user radio devices is under the control of the FCC licensee, and federal use must be in accordance with FCC rules governing the specified service. This section does not relieve federal users from any other policy requirements and it is the responsibility of the federal user to determine if its operations are eligible to operate under the FCC license or under the FCC rules.

Paging
Cellular
Personal Communications Service
Specialized Mobile Radio Wireless Communications Service
Consumer and Industrial Signal Boosters3
Blanket licenses for earth stations in the fixed-satellite, e.g., 14/12 GHz, and mobile-satellite
services4
3 = This includes use of subscriber-based services under 4 7 CFR Parts 22 (Cellular), 24 (Broadband PCS), 27
(AWS-1, 700 MHz Lower A-E Blocks, and 700 MHz Upper C Block), and 90 (Specialized MobileRadio) (see FCC Report and Order in the Matter of Amendment of Parts I, 2, 22, 24, 27, 90 and 95 of the Commission's Rules to Improve Wireless Coverage Through the Use of Signal Boosters, FCC 13-21 , WT Docket No. 10-4, Adopted and Released February 20, 2013.)

(U) The GlobalStar application of use is exactly the same as was used with Biarri Point that was approved under SPS Number 22496/1. The SPARC-1 Satellite will send "Tweet-like" Messages of basic satellite Health and Status on a fixed Frequency of 1616.250 MHz as set by GlobalStar when purchased by AFRL for this Experimental Application.

(U) ESTIMATED INITIAL COST: $1.3M Per ORCA Spacecraft.

STATIONS

Station Name : (U) ORCA CubeSat

Station Locations

(U) ORCA CubeSat #1, (U) Space

Location Type : (U) Non-geostationary Satellite
Apogee : (U) 500 km

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Perigee : (U) 500 km
Equatorial Inclination : (U) 50.0 degrees
Period Of Orbit : (U) 5676 s

(U) ORCA CubeSat #2, (U) Space
Location Type : (U) Non-geostationary Satellite
Apogee : (U) 500 km
Perigee : (U) 500 km
Equatorial Inclination : (U) 90.0 degrees
Period Of Orbit : (U) 5676 s

(U) ORCA CubeSat #5, (U) Space
Location Type : (U) Non-geostationary Satellite
Apogee : (U) 500 km
Perigee : (U) 500 km
Equatorial Inclination : (U) 52.0 degrees
Period Of Orbit : (U) 5676 s

(U) ORCA CubeSat #3, 4, 6, 7, (U) Space
Location Type : (U) Non-geostationary Satellite
Apogee : (U) 500 km
Perigee : (U) 500 km
Equatorial Inclination : (U) 45.0 degrees
Period Of Orbit : (U) 5676 s

Transmitters
Nomenclature : (U) SDR-S Band Downlink
Nomenclature : (U) XTX-X-Band Downlink
Nomenclature : (U) GlobalStar-STX3

Receivers
Nomenclature : (U) SDR-S Band Receiver

Antennas
Nomenclature : (U) ADC-S-Band
Nomenclature : (U) ADC-X-Band
Nomenclature : (U) GlobalStar-STX3 Antenna

Station Name : (U) KSAT Commercial S-Band & X-Band Ground Station
Antenna Height : (U) 8.00 m

Station Locations
(U) Long Beach-KSAT, (U) CA
Location Type : (U) Single Point
Lat/Lon : (U) 33 49'24"N 118 8'47"W

Receivers
Nomenclature : (U) KSAT X-Band MMR-LITE
Nomenclature : (U) KSAT S-Band QUANTUMRADIO

Antennas
Nomenclature : (U) KSAT X-Band Ground Station Antenna
Nomenclature : (U) KSAT S-Band Ground Station Antenna

Station Name : (U) GlobalStar FCC Licensed Satellite--LEO--SPS 22496/1 - Generic

Station Locations
(U) GlobalStar Satellite--LEO, (U) Space
Location Type : (U) Non-geostationary Satellite
Apogee : (U) 420 km
Perigee : (U) 420 km

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Equatorial Inclination : (U) 51.6 degrees
Period Of Orbit : (U) 5580 s

STATION INFORMATION

Transmitting Station:	Receiving Station:
(U) ORCA CubeSat - Generic	(U) GlobalStar FCC Licensed Satellite--LEO--SPS 22496/1 - Generic
Station Class: ES	Radio Service: Inter-Satellite

LINK INFORMATION

Transmitter:	Transmitter Antenna:
(U) GlobalStar-STX3	(U) GlobalStar-STX3 Antenna
Receiver:	Receiver Antenna:
(U) Generic	(U) Generic
	SP. Power Density:
	(U) -70.0 dBw/Hz

SELECTED MODES

Frequency	Emission Designator	Power	Notes
(U) 1616.250 MHz	(U) 2M32G1D	(U) 0.192 W Mean	[1]
[1] (U) Commercial crosslink for cost saving			

STATION INFORMATION

Transmitting Station:	Receiving Station:
(U) ORCA CubeSat	(U) KSAT Commercial S-Band & X-Band Ground Station
Station Class: EW, ET	Radio Service: Space Operation

LINK INFORMATION

Transmitter:	Transmitter Antenna:
(U) SDR-S Band Downlink	(U) ADC-S-Band
Receiver:	Receiver Antenna:
(U) KSAT S-Band QUANTUMRADIO	(U) KSAT S-Band Ground Station Antenna
	SP. Power Density:
	(U) -63.0 dBw/Hz

FULL RECORD PRINT FOR ORCA CUBESAT

SELECTED MODES

Frequency	Emission Designator	Power	Notes
(U) 2217.000 MHz	(U) 4M00G1D	(U) 2.00 W Mean	PRI

LINK INFORMATION

Transmitter: (U) XTX-X-Band Downlink	Transmitter Antenna: (U) ADC-X-Band
Receiver: (U) KSAT X-Band MMR-LITE	Receiver Antenna: (U) KSAT X-Band Ground Station Antenna
	SP. Power Density: (U) -77.0 dBw/Hz

SELECTED MODES

Frequency	Emission Designator	Power	Notes
(U) 8050.000 MHz	(U) 50M0G1D	(U) 1.00 W Mean	PRI

TRANSMITTER EQUIPMENT CHARACTERISTICS

Nomenclature: (U) GlobalStar-STX3	**Manufacturer:** (U) GlobalStar LLC
NTIA Approval Status: (U) Unapproved	**Coordination ID:** J/F 12
Date of Import: 5/13/2019 1:46:18 PM (GMT)	**Date/Time Last Mod.:** 5/23/2019 5:37:30 PM (GMT)
Fcc Acc. Number: (U) L2V-STX3	**Radar/Comm:** (U) Communications
Model Name: (U) GlobalStar-STX3	**Output Device:** (U) Transistor
Tuning Method: (U) Programmable Frequency Synthesizer	**Supp. of Harmonics:** (U) Yes
Freq. Stability: (U) 0.001ppm	
Tx Type: (U) CDMA Data Communications	
Filter Type (U) Bandpass	

POWER

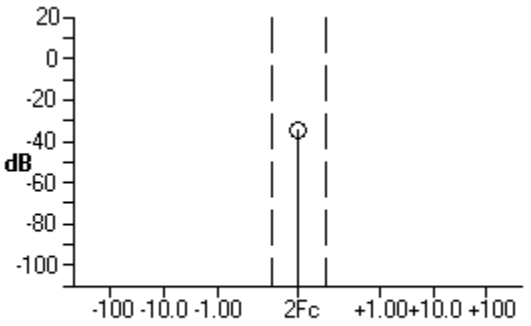
Power Type: Mean	
Upper Limit: (U) 0.192 W	

2ND HARMONIC CURVE

(UNCLASSIFIED)

Atten.
-35.0 dB

Offset (Fo)
0.00000 kHz



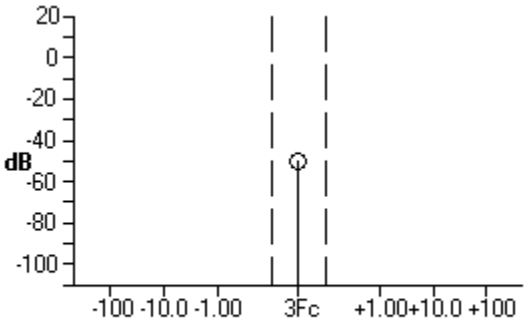
TRANSMITTER EQUIPMENT CHARACTERISTICS

3RD HARMONIC CURVE

(UNCLASSIFIED)

Atten. -50.0 dB

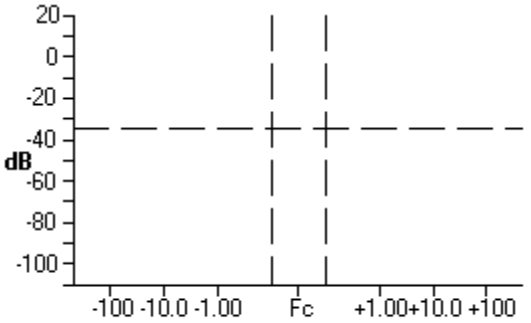
Offset (Fo) 0.00000 kHz



SPURIOUS EMISSION CURVE

(UNCLASSIFIED)

Maximum Spurious Emission Atten.
-35.0 dB



FREQUENCIES

Fixed Frequency: (U) 1616.250 MHz

Freq. Blocking Indicator: (U) No

EMISSION DESIGNATORS

Em. Designator: (U) 2M32G1D

Necessary BW: (U) 2320.0 kHz

Dig. Spectrum Code: (U) Non-return to Zero

Radar/Communications: (U) Communications

Measured/Calculated: (U) Measured

Occupied Bandwidth: (U) 2327.7 kHz

Modulation Type: (U) Digital Modulation

Spread Spectrum: No

TRANSMITTER EQUIPMENT CHARACTERISTICS

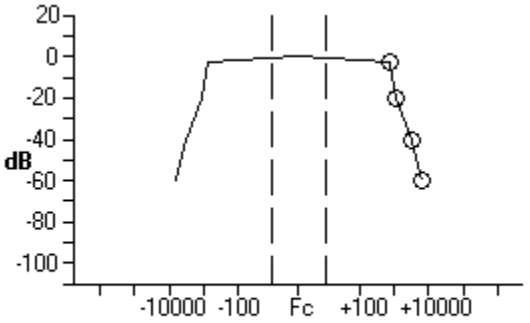
Dig. Modulation Type: (U) QPSK - Quadrature Phase Shift Keying	**Digital Bit Rate:** (U) 256000 bps

FUNDAMENTAL CURVE

(UNCLASSIFIED)

Meas/Calc: Measured

Level	**Offset (Fo)**
-3.00 dB	730.00 kHz
-20.0 dB	1150.0 kHz
-40.0 dB	3350.0 kHz
-60.0 dB	6050.0 kHz



TRANSMITTER EQUIPMENT CHARACTERISTICS

Nomenclature: (U) XTX-X-Band Downlink

Manufacturer: (U) BLUE CANYON TECHNOLOGIES

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 4/16/2019 2:11:19 PM (GMT)

Fcc Acc. Number:

Radar/Comm: (U) Communications

Model Name: (U) XTX-X-Band Downlink

Output Device: (U) Other

Tuning Method: (U) Direct Digital Synthesizer

Supp. of Harmonics: (U) Yes

Freq. Stability: (U) 0.12ppm

Tx Type: (U) PSK Data Communications

Filter Type
(U) Solid State Power Amplifier GaAs pHEMT Amplifier

POWER

Power Type: Mean

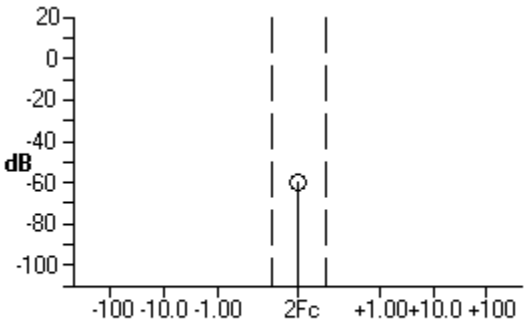
Upper Limit: (U) 1.00 W

2ND HARMONIC CURVE

(UNCLASSIFIED)

Atten.
-60.0 dB

Offset (Fo)
0.00000 kHz



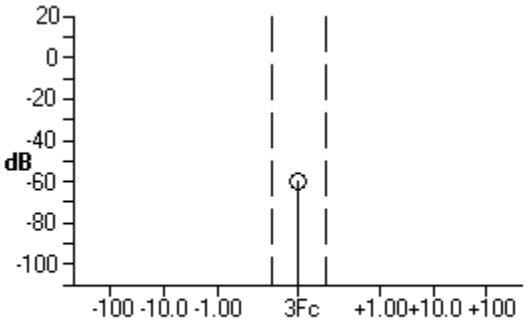
TRANSMITTER EQUIPMENT CHARACTERISTICS

3RD HARMONIC CURVE

(UNCLASSIFIED)

Atten. -60.0 dB

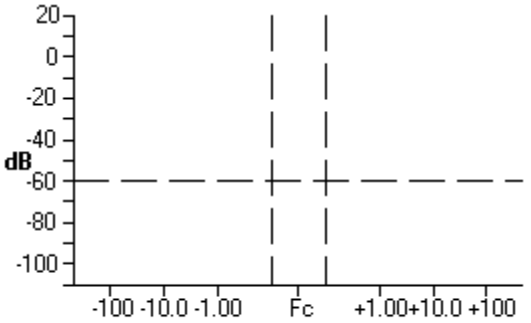
Offset (Fo) 0.00000 kHz



SPURIOUS EMISSION CURVE

(UNCLASSIFIED)

Maximum Spurious Emission Atten.
-60.0 dB



FREQUENCIES

Fixed Frequency: (U) 8050.000 MHz

Freq. Blocking Indicator: (U) No

EMISSION DESIGNATORS

Em. Designator: (U) 50M0G1D

Necessary BW: (U) 50000 kHz

Dig. Spectrum Code: (U) NRZ-M (non return to zero mark)

Radar/Communications: (U) Communications

Measured/Calculated: (U) Measured

Occupied Bandwidth: (U) 35700 kHz

Modulation Type: (U) Digital Modulation

Spread Spectrum: No

TRANSMITTER EQUIPMENT CHARACTERISTICS

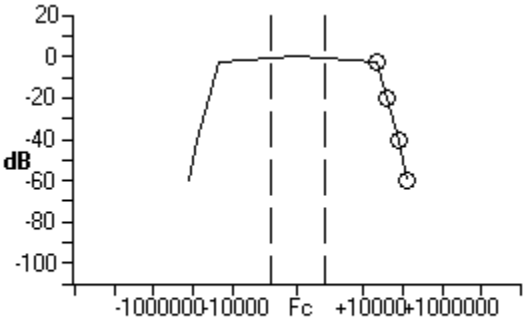
Dig. Modulation Type: (U) OQPSK - Offset Quadrature Phase Shift Keying	**Digital Bit Rate:** (U) 25000000 bps
Number of Digital States: (U) 4	
	Digital Pulse Format: (U) NRZ-M (non return to zero mark)

FUNDAMENTAL CURVE

(UNCLASSIFIED)

Meas/Calc: Measured

Level	Offset (Fo)
-3.00 dB	22000 kHz
-20.0 dB	40000 kHz
-40.0 dB	76000 kHz
-60.0 dB	120000 kHz



Remark(s) (U)

(U) X-Band will be utilized as a Real-Time Payload Data Downlink to the KSAT Ground Station Network.

(U) MODULATION TECHNIQUES and CODING: Direct Carrier OQPSK, FEC Convolutional Rate 1/2 (50 MHZ)

(U) DEVIATION RATIO DATA: PM states this section is Not Applicable to PSK Systems.

(U) FREQUENCY STABILITY: 0.12 PPM based on 1KHZ Maximum (Fractional PLL + VCO Temperature Drift)

(U) METHOD OF TUNING: Direct Digital Synthesizer with a Voltage Controlled Oscillator.

(U) EMISSION BANDWIDTH Data for the RF Fundamental Curve was "Measured" at a Bandwidth of 10 MHz and extrapolated to 45 MHz.

FULL RECORD PRINT FOR ORCA CUBESAT

Cont.

(U) OUTPUT DEVICE: Per the Amplifier manufacturer, the Output Device is a Solid State HMC7357 GaAs pHEMPT (pseudomorphic High Electron Mobility Transistor) Amplifier.

TRANSMITTER EQUIPMENT CHARACTERISTICS

Nomenclature: (U) SDR-S Band Downlink	**Manufacturer:** (U) BLUE CANYON TECHNOLOGIES
NTIA Approval Status: (U) Unapproved	**Coordination ID:** J/F 12
Date of Import: 5/13/2019 1:46:18 PM (GMT)	**Date/Time Last Mod.:** 4/11/2019 6:51:11 PM (GMT)
Fcc Acc. Number:	**Radar/Comm:** (U) Communications
Model Name: (U) SDR-S Band	**Output Device:** (U) Other
Tuning Method: (U) PLL Synthesizer	**Supp. of Harmonics:** (U) Yes
Freq. Stability: (U) 1ppm	
Tx Type: (U) PSK Data Communications	
Filter Type (U) External Diplexer	

POWER

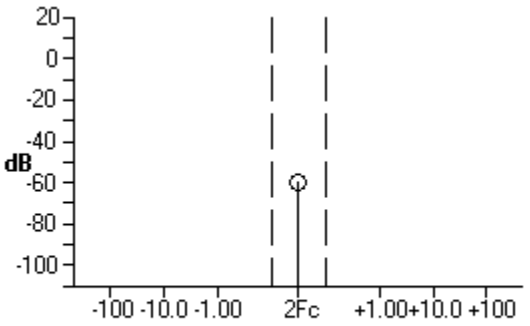
Power Type: Mean	
Upper Limit: (U) 2.00 W	

2ND HARMONIC CURVE

(UNCLASSIFIED)

Atten.
-60.0 dB

Offset (Fo)
0.00000 kHz



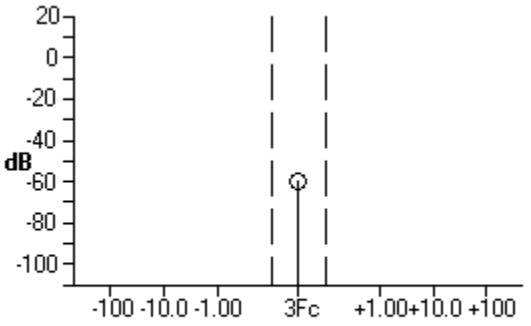
TRANSMITTER EQUIPMENT CHARACTERISTICS

3RD HARMONIC CURVE

(UNCLASSIFIED)

Atten.
-60.0 dB

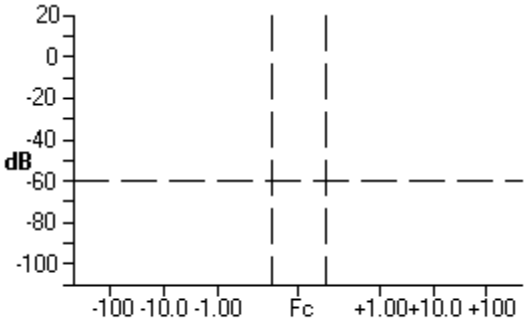
Offset (Fo)
0.00000 kHz



SPURIOUS EMISSION CURVE

(UNCLASSIFIED)

Maximum Spurious Emission
Atten.
-60.0 dB



FREQUENCIES

Fixed Frequency: (U) 2217.000 MHz

Freq. Blocking Indicator: (U) No

EMISSION DESIGNATORS

Em. Designator: (U) 4M00G1D

Necessary BW: (U) 4000.0 kHz

Dig. Spectrum Code: (U) NRZ-M (non return to zero mark)

Radar/Communications: (U) Communications

Measured/Calculated: (U) Measured

Occupied Bandwidth: (U) 3600.0 kHz

Modulation Type: (U) Digital Modulation

Spread Spectrum: No

TRANSMITTER EQUIPMENT CHARACTERISTICS

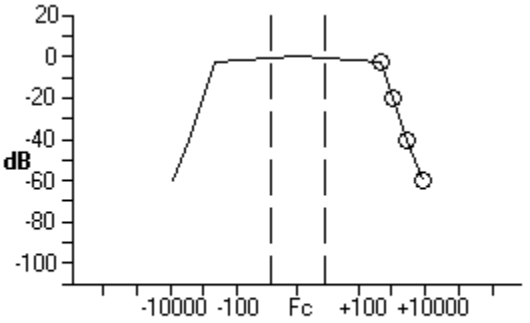
Dig. Modulation Type: (U) OQPSK - Offset Quadrature Phase Shift Keying	**Digital Bit Rate:** (U) 2000000 bps
Number of Digital States: (U) 4	
	Digital Pulse Format: (U) NRZ-M (non return to zero mark)

FUNDAMENTAL CURVE

(UNCLASSIFIED)

Meas/Calc: Measured

Level	Offset (Fo)
-3.00 dB	500.00 kHz
-20.0 dB	1100.0 kHz
-40.0 dB	2779.0 kHz
-60.0 dB	8000.0 kHz



Remark(s) (U)

(U) MODULATION TECHNIQUES and CODING: OQPSK, CONVOLUTIONAL (K=7, R=1/2)

(U) METHOD OF TUNING: SOFTWARE Tuning using VCXO W/ PLL to Reference.

(U) DEVIATION RATIO DATA: PM states this section is Not Applicable to PSK Systems.

(U) FILTERING: External to the Transmitter is the S-band Diplexer that provides filtering for all out-of-band spurs / harmonics, as well as Splitting the TX/RCV signal appropriately from SDR TX and RCV ports to/from the Stacked Patch Antenna.

(U) OUTPUT DEVICE: 2-Stage Linear Amplifier

RECEIVER EQUIPMENT CHARACTERISTICS

Nomenclature: (U) KSAT S-Band QUANTUMRADIO

Manufacturer: (U) KRATOS

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 4/1/2020 6:01:53 PM (GMT)

Model Name: (U) QUANTUMRADIO

Fcc Acc. Number:

Image Reject: (U) 70.0 dB

Oscillator Tuned: (U) Either

Cond. Undesired Em.: (U) -60.0 dBm

Proxy: No

Homodyne: No

RxType
(U) Software Modem for Small Satellites

Maximum Bit Rate: (U) 2500000 bps

FREQUENCIES

Fixed Frequency: (U) 2217.000 MHz

Tuning Method: (U) Digital Synthesizer

Freq. Stability: (U) 1500000Hz

EMISSION DESIGNATORS

Em. Designator: (U) 4M00G1D

Sensitivities

Sensitivity: (U) -60.0 dBm
Necessary BW:
Perf. Value: (U) 0.000001
Noise Figure: (U) 7.00 dB
Noise Temp. (U) 1163 K
Spur. Reject (U) 60.0 dB
Intermod. Reject: (U) 60.0 dB
Adj. Channel Sel.:
Perf. Crit.: (U) (S+N)/N - (Signal Plus Noise) to Noise Ratio (dB)

RECEIVER EQUIPMENT CHARACTERISTICS

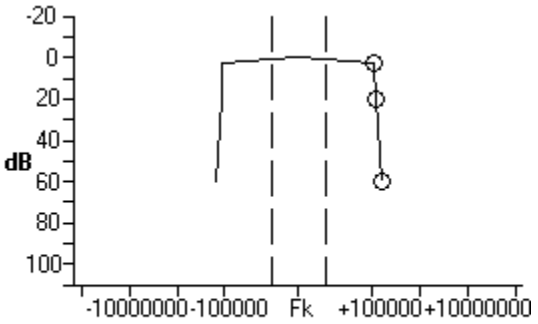
IF SELECTIVITY CURVE

(UNCLASSIFIED)

Measured/Calculated: Measured

IF Freq. (Fk): 720.0000 MHz

Atten.	**Offset (Fo)**
3.00 dB	110000 kHz
20.0 dB	113500 kHz
60.0 dB	157500 kHz



RECEIVER EQUIPMENT CHARACTERISTICS

Nomenclature: (U) KSAT X-Band MMR-LITE

Manufacturer: (U) KRATOS

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 4/1/2020 6:02:32 PM (GMT)

Model Name: (U) MMR-LITE

Fcc Acc. Number:

Image Reject: (U) 70.0 dB

Oscillator Tuned: (U) Either

Cond. Undesired Em.: (U) -60.0 dBm

Proxy: No

Homodyne: No

RxType
(U) Multi-Mission Radio

Maximum Bit Rate: (U) 250000000 bps

FREQUENCIES

Fixed Frequency: (U) 8050.000 MHz

Tuning Method: (U) Digital Synthesizer

Freq. Stability: (U) 1500000Hz

EMISSION DESIGNATORS

Em. Designator: (U) 50M0G1D

Sensitivities

Sensitivity: (U) -50.0 dBm
Necessary BW:
Perf. Value: (U) 0.000001
Noise Figure: (U) 20.0 dB
Noise Temp. (U) 28710 K
Spur. Reject (U) 60.0 dB
Intermod. Reject: (U) 60.0 dB
Adj. Channel Sel.:
Perf. Crit.: (U) (S+N)/N - (Signal Plus Noise) to Noise Ratio (dB)

RECEIVER EQUIPMENT CHARACTERISTICS

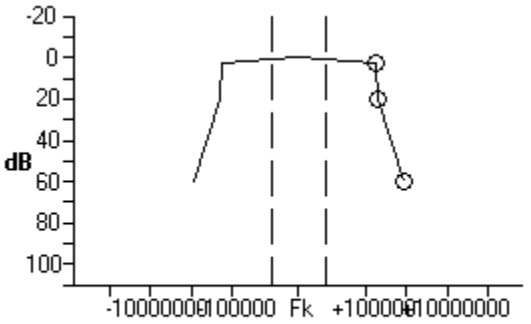
IF SELECTIVITY CURVE

(UNCLASSIFIED)

Measured/Calculated: Measured

IF Freq. (Fk): 1200.000 MHz

Atten.	Offset (Fo)
3.00 dB	182500 kHz
20.0 dB	197500 kHz
60.0 dB	815000 kHz



Remark(s) (U)

(U) LOCAL OSCILLATOR TUNED INDICATOR: The Local Oscillator is not tuned "Above" or "Below", but always Tuned at the Required Frequency.

RECEIVER EQUIPMENT CHARACTERISTICS

Nomenclature: (U) SDR-S Band Receiver

Manufacturer: (U) BLUE CANYON TECHNOLOGIES

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 5/23/2019 5:15:16 PM (GMT)

Model Name: (U) SDR-S Band Receiver

Fcc Acc. Number:

Image Reject: (U) 80.0 dB

Oscillator Tuned: (U) Above

Cond. Undesired Em.:

Proxy: No

Homodyne: No

RxType
(U) SuperHeterodyne

Maximum Bit Rate: (U) 100000 bps

Preselection Type
(U) Diplexer

FREQUENCIES

Fixed Frequency: (U) 2085.500 MHz

Tuning Method: (U) PLL Synthesizer

Freq. Stability: (U) 1ppm

EMISSION DESIGNATORS

Em. Designator: (U) 200KG1D

Sensitivities

Sensitivity: (U) -121 dBm
Necessary BW:
Perf. Value: (U) 0.000001
Noise Figure: (U) 3.08 dB
Noise Temp. (U) 300 K
Spur. Reject (U) 66.0 dB
Intermod. Reject:
Adj. Channel Sel.: (U) 40.0 dB
Perf. Crit.: (U) BER - Bit Error Rate

RECEIVER EQUIPMENT CHARACTERISTICS

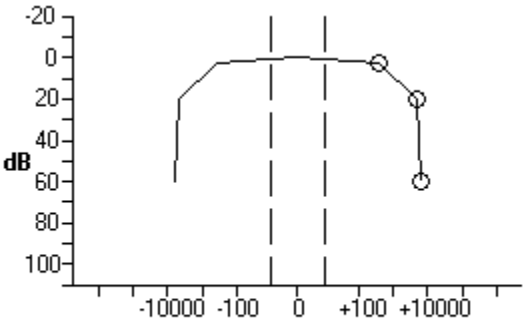
IF SELECTIVITY CURVE

(UNCLASSIFIED)

Measured/Calculated: Measured

IF Freq. (Fk): 0.0000000 MHz

Atten.	Offset (Fo)
3.00 dB	357.40 kHz
20.0 dB	5000.0 kHz
60.0 dB	6000.0 kHz

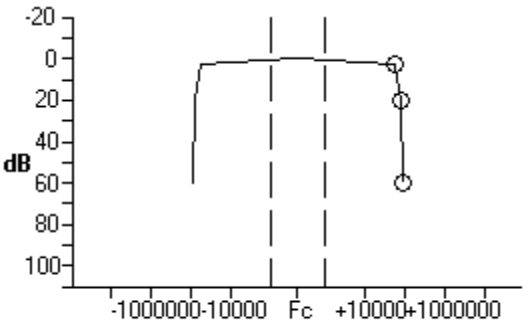


RF SELECTIVITY CURVE

(UNCLASSIFIED)

Measured/Calculated: Measured

Atten.	Offset (Fo)
3.00 dB	55000 kHz
20.0 dB	75000 kHz
60.0 dB	88000 kHz



Remark(s) (U)

(U) METHOD OF TUNING: SOFTWARE Tuning using VCXO W/ PLL to Reference.

(U) RF SELECTIVITY: PM States there is RF Filter Attenuation at the -60 dB Point.

ANTENNA EQUIPMENT CHARACTERISTICS

Nomenclature: (U) KSAT S-Band Ground Station Antenna

Manufacturer: (U) ORBITAL SYSTEMS INC

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 5/23/2019 5:53:16 PM (GMT)

Model Name: (U) 3.0TSXS1-3.7M

Antenna Type: (U) Parabolic Reflector

Antenna Category: Aperture

FREQUENCIES

Lower Frequency Limit: (U) 2025.000 MHz
Upper Frequency Limit: (U) 2300.000 MHz

ANTENNA CHARACTERISTICS

Polarization: (U) Right and Left Hand Circular

Atten. Rel/Act: (U) Relative dB

Vert. Min. Elev.: (U) -2.00 degrees

Vert. Max. Elev.: (U) 90.0 degrees

Dish Diameter:

Capable of Blanking: (U) Yes

BEAMWIDTH

Horizontal: (U) 2.46 degrees

Vertical: (U) 2.46 degrees

SCAN CHARACTERISTICS

Horizontal Scan Type: (U) 360 Degrees Rotating

Horizontal Scan Rate:

Vertical Scan Type: (U) 360 Degrees Rotating

Vertical Scan Rate:

Horizontal Scan Speed: (U) 60.0 degrees/sec

Vertical Scan Speed: (U) 20.0 /sec

GAIN

Main Beam: (U) 27.8 dBi

1st Horz. Side Lobe Atten.: (U) 14.0 dB

1st Ver. Side Lobe Atten.: (U) 14.0 dB

Degrees of Scan: (U) 360 degrees

ANTENNA EQUIPMENT CHARACTERISTICS

Nomenclature: (U) KSAT X-Band Ground Station Antenna

Manufacturer: (U) ORBITAL SYSTEMS INC

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 5/23/2019 5:26:37 PM (GMT)

Model Name: (U) 3.0TSXS1-3.7M

Antenna Type: (U) Parabolic Reflector

Antenna Category: Aperture

FREQUENCIES

Lower Frequency Limit: (U) 8000.000 MHz
Upper Frequency Limit: (U) 8400.000 MHz

ANTENNA CHARACTERISTICS

Polarization: (U) Right and Left Hand Circular

Atten. Rel/Act: (U) Relative dB

Vert. Min. Elev.: (U) -2.00 degrees

Vert. Max. Elev.: (U) 90.0 degrees

Dish Diameter:

Capable of Blanking: (U) Yes

BEAMWIDTH

Horizontal: (U) 0.670 degrees

Vertical: (U) 0.670 degrees

SCAN CHARACTERISTICS

Horizontal Scan Type: (U) 360 Degrees Rotating

Horizontal Scan Rate:

Vertical Scan Type: (U) 360 Degrees Rotating

Vertical Scan Rate:

Horizontal Scan Speed: (U) 60.0 degrees/sec

Vertical Scan Speed: (U) 20.0 /sec

GAIN

Main Beam: (U) 26.9 dBi

1st Horz. Side Lobe Atten.: (U) 14.0 dB

1st Ver. Side Lobe Atten.: (U) 14.0 dB

Degrees of Scan: (U) 360 degrees

ANTENNA EQUIPMENT CHARACTERISTICS

Nomenclature: (U) GlobalStar-STX3 Antenna

Manufacturer: (U) API Technologies Corp

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 3/4/2019 7:52:05 PM (GMT)

Model Name: (U) PA451615-1575SA

Antenna Type: (U) Patch

Antenna Category: Linear

FREQUENCIES

Lower Frequency Limit: (U) 1581.000 MHz
Upper Frequency Limit: (U) 1648.000 MHz

ANTENNA CHARACTERISTICS

Polarization: (U) Left Hand Circular

Atten. Rel/Act: (U) Relative dB

BEAMWIDTH

Horizontal: (U) 80.0 degrees

Vertical: (U) 80.0 degrees

SCAN CHARACTERISTICS

GAIN

Main Beam: (U) 6.00 dBi

1st Horz. Side Lobe Atten.: (U) 18.0 dB

1st Ver. Side Lobe Atten.: (U) 18.0 dB

ANTENNA EQUIPMENT CHARACTERISTICS

Nomenclature: (U) ADC-X-Band

Manufacturer: (U) AntDevCo

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 3/1/2019 8:39:09 PM (GMT)

Model Name: (U) ADC-X-Band

Antenna Type: (U) Microstrip

Antenna Category: Linear

FREQUENCIES

Lower Frequency Limit: (U) 8025.000 MHz
Upper Frequency Limit: (U) 8400.000 MHz

ANTENNA CHARACTERISTICS

Polarization: (U) Right Hand Circular

Atten. Rel/Act: (U) Relative dB

BEAMWIDTH

Horizontal: (U) 50.0 degrees

Vertical: (U) 50.0 degrees

SCAN CHARACTERISTICS

GAIN

Main Beam: (U) 11.0 dBi

1st Horz. Side Lobe Atten.: (U) 30.0 dB

1st Ver. Side Lobe Atten.: (U) 30.0 dB

ANTENNA EQUIPMENT CHARACTERISTICS

Nomenclature: (U) ADC-S-Band

Manufacturer: (U) AntDevCo

NTIA Approval Status: (U) Unapproved

Coordination ID: J/F 12

Date of Import: 5/13/2019 1:46:18 PM (GMT)

Date/Time Last Mod.: 3/1/2019 8:36:20 PM (GMT)

Model Name: (U) ADC-S-Band

Antenna Type: (U) Microstrip

Antenna Category: Linear

FREQUENCIES

Lower Frequency Limit: (U) 2025.000 MHz
Upper Frequency Limit: (U) 2290.000 MHz

ANTENNA CHARACTERISTICS

Polarization: (U) Right Hand Circular

Atten. Rel/Act: (U) Relative dB

BEAMWIDTH

Horizontal: (U) 80.0 degrees

Vertical: (U) 80.0 degrees

SCAN CHARACTERISTICS

GAIN

Main Beam: (U) 6.00 dBi

1st Horz. Side Lobe Atten.: (U) 17.0 dB

1st Ver. Side Lobe Atten.: (U) 17.0 dB

Frequency List

Tx Station	Rx Station	Frequency (MHz)	Em. Des.	Radio Service	Stn. Classes
(U) ORCA CubeSat	(U) GlobalStar FCC	(U) 1616.250	(U) 2M32G1D	Inter-Satellite	ES
	(U) KSAT Commercial S-Band & X-Band Grou	(U) 2217.000	(U) 4M00G1D	Space Operation	ET
		(U) 8050.000	(U) 50M0G1D	Earth Exploration-Satell	EW

Table of Contents For

(U) ORCA CubeSat

ALSO:

Line Diagram: ORCA CubeSat