## SECURITY SUMMARY & SPECIAL HANDLING REQUIREMENTS

**The title of this application is :** TACSAT-4 SPACE PAYLOAD

**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

**FULL RECORD PRINT FOR TACSAT-4 Space Payload**

**Selected Frequencies**

(U) 240.00 MHz - (U) 270.00 MHz
(U) 375.00 MHz - (U) 380.00 MHz
(U) 400.18 MHz
(U) 7589.2 MHz

**System Name (Nomenclature)** : (U) TACSAT-4 Space Payload
**Coord.ID/JF12 Num.** : (U)/(U) J/F 12/9752
**Stage** : (U) 2 - Experimental
**Agency** : (U) N - Department of the Navy
**NTIA Certified** : (U) No
**Overall Security** : Unclassified

**Date/Time Last Mod.** : 3/4/2010 2:16:40 PM (GMT)
**System Description** : (U) Experimental satellite system under control of the theater commander to augment current UHF communications capabilities and to evaluate future communication techniques such as the Mobile USER Objective System (MUOS).

System enables communications on-the-move with legacy UHF radio systems without ground antenna pointing. Satellite also receives from & transmits data to ocean buoys, unattended ground sensors, and ODTML transportable ground terminals.

**Target Date(s)**

**System Approval** : (U) 4/1/2010
**System Activation** : (U) 4/1/2010
**System Termination** : (U) 4/1/2011

**NSEP Use** : (U) Yes
**ITU Waiver** : (U) Yes

**Control Numbers**

**SPS-** 17347/1

**Source Documents**

- (U) SPS - NA Space System Stage 2 Requirements.doc 1/25/2010
- (U) SPS - 17347/1 TACSAT-4 Space Payload Certification Application 3/4/2010

**Number Of Units** : (U) 1
**Estimated Initial Cost of the System** : (U) $64000000

**Information Transfer Requirement**

(U) Analog voice, digital and multi-channel data.

**System Essentiality**

(U) Experimental satellite system under control of the theater commander that supports operation with legacy UHF satellite communications radios, wideband experiments, UHF blue force tracking collection and data exfiltration from sensors.

**Replacement Information**

(U) Not Applicable

**FULL RECORD PRINT FOR TACSAT-4 Space Payload**

**Stations**

**Station Name** : (U) TACSAT-4 Space Payload
**City, State/Country** : (U) Space
**Location Type** : (U) Non-geostationary Satellite
**Apogee** : (U) 12050 km
**Perigee** : (U) 700 km
**Equatorial Inclination** : (U) 63.4 degrees
**Period Of Orbit** : (U) 14400 s

**Transmitters**

(U) TacSat- 4 Narrow-Band
(U) TacSat-4 Wide-Band
(U) TR-400 (ODTML)
(U) X-Band Repeater

**Receivers**

(U) TacSat-4 UHF
(U) Model TR-400 (ODTML)
(U) X-Band Receiver

**Antennas**

(U) UHF
(U) X
(U) X-2

**Station Name** : (U) Mobile Earth - Generic

**Links - Selected Modes**

**Link**

| Transmitting Station | Receiving Station |
|---|---|
| (U) TACSAT-4 Space Payload | (U) Mobile Earth |

**Radio Service** : Land Mobile-Satellite
**Station Class** : EU
**Equipment Combination**
**Transmitter** : (U) TacSat-4 Wide-Band
**Tx Antenna** : (U) UHF
**Receiver** : Generic
**Rx Antenna** : Generic
**Sp. Power Density** : (U) -33.5 dBw/Hz

**Selected Modes**

| Frequency | Em. Des | Power | Notes |
|---|---|---|---|
| (U) 375.00 MHz - (U) 380.00 MHz | (U) 64K0G1D | Mean (U) 5.00 W | PRI |
| (U) 375.00 MHz - (U) 380.00 MHz | (U) 256KG1D | Mean (U) 5.00 W | PRI |
| (U) 375.00 MHz - (U) 380.00 MHz | (U) 1M02G1D | Mean (U) 5.00 W | PRI |
| (U) 375.00 MHz - (U) 380.00 MHz | (U) 2M50G1D | Mean (U) 5.00 W | PRI |
| (U) 375.00 MHz - (U) 380.00 MHz | (U) 5M00G1D | Mean (U) 5.00 W | PRI |

**Equipment Combination**

FULL RECORD PRINT FOR TACSAT-4 Space Payload

**Transmitter** : (U) TacSat- 4 Narrow-Band
**Tx Antenna** : (U) UHF
**Receiver** : Generic
**Rx Antenna** : Generic
**Sp. Power Density** : (U) -32.2 dBw/Hz

**Selected Modes**

| Frequency | Em. Des | Power | Notes |
|---|---|---|---|
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 25K0G1D | Mean (U) 2.00 W | PRI |
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 22K0F1D | Mean (U) 2.00 W | PRI |
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 22K0F3E | Mean (U) 2.00 W | PRI |
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 18K5F3E | Mean (U) 2.00 W | PRI |
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 16K0F3E | Mean (U) 2.00 W | PRI |
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 4K80G1D | Mean (U) 2.00 W | PRI |
| (U) 240.00 MHz - (U) 270.00 MHz | (U) 2K40G1D | Mean (U) 2.00 W | PRI |

**Equipment Combination**

**Transmitter** : (U) TR-400 (ODTML)
**Tx Antenna** : (U) UHF
**Receiver** : Generic
**Rx Antenna** : Generic
**Sp. Power Density** : (U) -29.0 dBw/Hz

**Selected Modes**

| Frequency | Em. Des | Power | Notes |
|---|---|---|---|
| (U) 400.18 MHz | (U) 6K48F1D | | [1] |

[1] (U) Experimental Tactical Satellite

**Equipment Combination**

**Transmitter** : (U) X-Band Repeater
**Tx Antenna** : (U) X
**Receiver** : Generic
**Rx Antenna** : Generic
**Sp. Power Density** : (U) -30.3 dBw/Hz

**Selected Modes**

| Frequency | Em. Des | Power | Notes |
|---|---|---|---|
| (U) 7589.2 MHz | (U) 50M0W9W | Mean (U) 10.0 W | PRI |

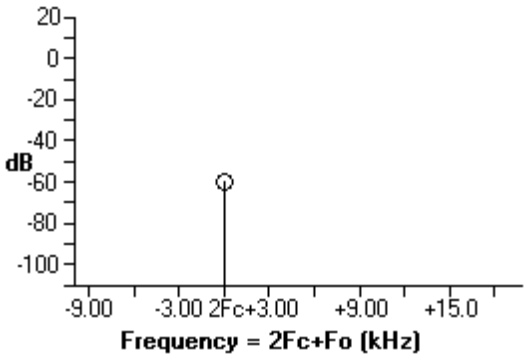
**FULL RECORD PRINT FOR TACSAT-4 Space Payload**

**TRANSMITTER X-Band Repeater**

| | | |
|---|---|---|
| **Nomenclature** | : | (U) X-Band Repeater |
| **Manufacturer** | : | (U) NAVAL RESEARCH LAB |
| **Model Name** | : | (U) X-Band Repeater |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 2/19/2010 8:08:04 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Fcc Acc. Number** | : | (U) Not Applicable |
| **Freq. Stability** | : | (U) 0.3 ppm |
| **Output Device** | : | (U) Transistor |
| **Tuning Method** | : | (U) Fixed |
| **Radar/Comm** | : | (U) Communications |
| **Supp. of Harmonics** | : | (U) Yes |

**Figure 1 - 2nd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -60.0 dB | 0.00000 kHz |




**(UNCLASSIFIED)**

**Figure 2 - 3rd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -60.0 dB | 0.00000 kHz |

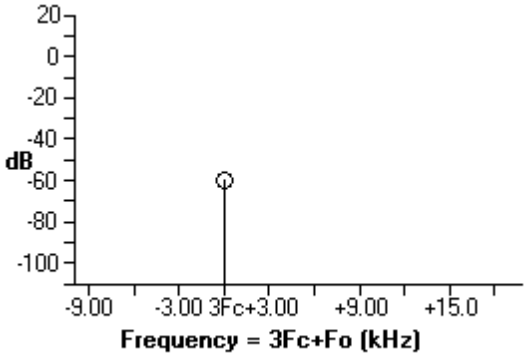



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**Figure 3 - Other Harmonic Curve (U)**

**Atten.** -60.0 dB
**Offset (Fo)** 0.00000 kHz

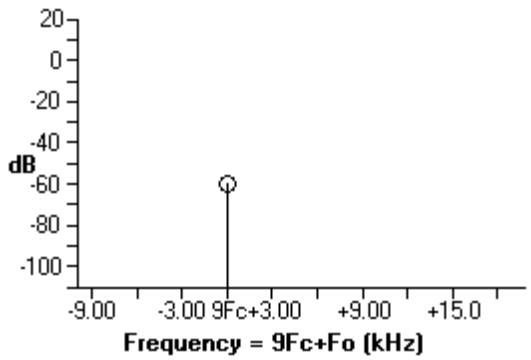


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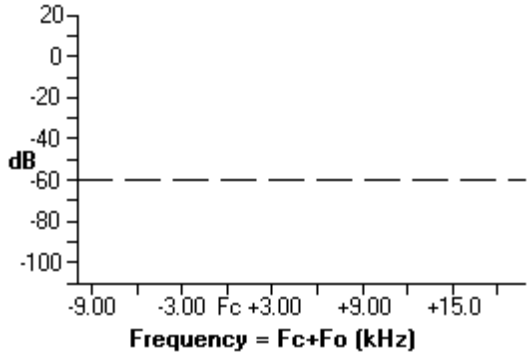
**Figure 4 - Spurious Emission Curve (U)**

**Maximum Spurious Emission**
**Atten.**
-60.0 dB

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**Frequencies**

**Fixed Frequency** : (U) 7589.2 MHz
**Em. Designator** : (U) 50M0W9W
**Neccessary BW** : (U) 50000 kHz

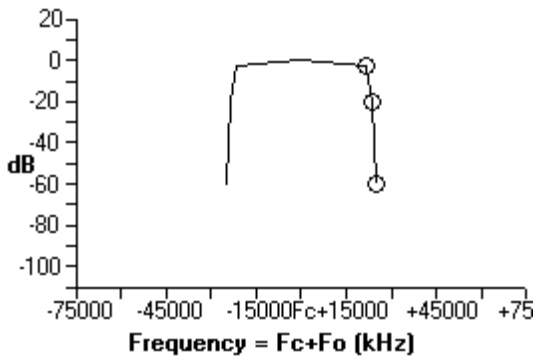
**Modulation - 50M0W9W**

**Occupied Bandwidth** : (U) 50.000 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Digital Modulation
**Spread Spectrum** : No
**Dig. Modulation Type** : (U) OTH - Other
**Digital Bit Rate** : (U) 64000 bps

**Figure 5 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 21750 kHz |
| -20.0 dB | 23750 kHz |
| -60.0 dB | 25000 kHz |

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**Powers**

**Power Type :** Mean
**Upper Limit :** (U) 10.0 W

FULL RECORD PRINT FOR TACSAT-4 Space Payload

## TRANSMITTER TR-400 (ODTML)

| | | |
|---|---|---|
| **Nomenclature** | : | (U) TR-400 (ODTML) |
| **Manufacturer** | : | (U) SPACEQUEST LTD. |
| **Model Name** | : | (U) TR-400 (ODTML) |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 1/27/2010 4:23:38 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Fcc Acc. Number** | : | (U) Not Applicable |
| **Freq. Stability** | : | (U) 1.5 ppm |
| **Output Device** | : | (U) Transistor |
| **Tuning Method** | : | (U) PLL Synthesizer |
| **Radar/Comm** | : | (U) Communications |
| **Supp. of Harmonics** | : | (U) Yes |

**Figure 6 - 2nd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -58.0 dB | 0.00000 kHz |

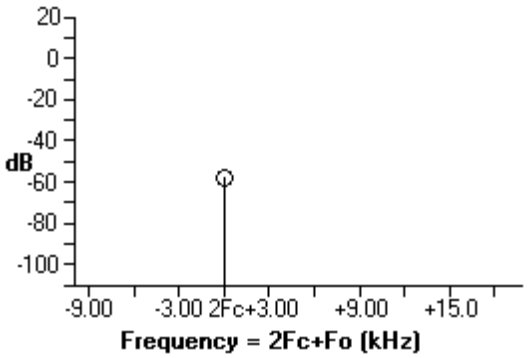


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**Figure 7 - 3rd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -58.0 dB | 0.00000 kHz |

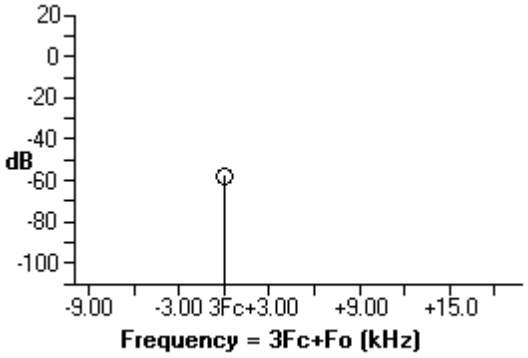


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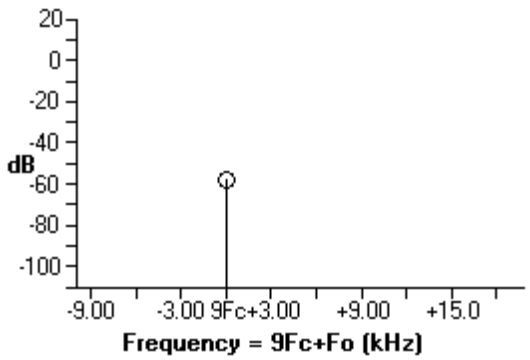
**Figure 8 - Other Harmonic Curve (U)**

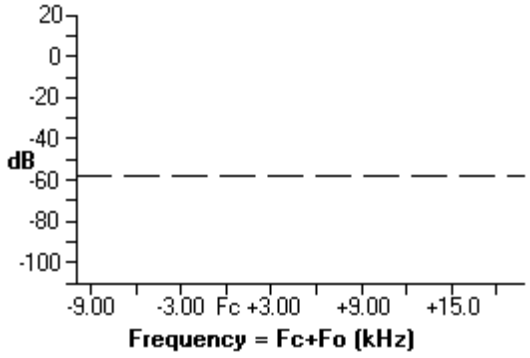
**Atten.** -58.0 dB **Offset (Fo)** 0.00000 kHz




**(UNCLASSIFIED)**

**Figure 9 - Spurious Emission Curve (U)**

**Maximum Spurious Emission**
**Atten.**
-58.0 dB

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**Frequencies**

**Fixed Frequency** : (U) 400.18 MHz
**Em. Designator** : (U) 6K48F1D
**Neccessary BW** : (U) 6.4800 kHz

**Modulation - 6K48F1D**

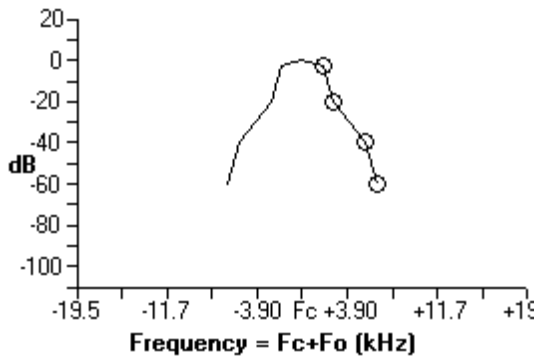
| | | |
|---|---|---|
| **Occupied Bandwidth** | : | (U) 6.8000 kHz |
| **Measured/Calculated** | : | (U) Measured |
| **Radar/Communications** | : | (U) Communications |
| **Modulation Type** | : | (U) Digital Modulation |
| **Max. Modulation Frequency** | : | (U) 3.4000 kHz |
| **Spread Spectrum** | : | No |
| **Dig. Modulation Type** | : | (U) GFSK - Gaussian Frequency Shift Keying |
| **Number of Digital States** | : | (U) 2 |
| **Digital Bit Rate** | : | (U) 2400 bps |
| **Deviation Ratio** | : | (U) 0.500 |
| **Digital Peak Deviation** | : | (U) 1.7000 kHz |

FULL RECORD PRINT FOR Transmitter

**Figure 10 - Fundamental Curve (U)**

**Meas/Calc :** Measured

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 1.8500 kHz |
| -20.0 dB | 2.7000 kHz |
| -40.0 dB | 5.5000 kHz |
| -60.0 dB | 6.5000 kHz |

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FULL RECORD PRINT FOR TACSAT-4 Space Payload

**TRANSMITTER TacSat-4 Wide-Band**

| | | |
|---|---|---|
| **Nomenclature** | : | (U) TacSat-4 Wide-Band |
| **Manufacturer** | : | (U) NAVAL RESEARCH LAB |
| **Model Name** | : | (U) TacSat-4 Wide-Band |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 2/19/2010 3:56:33 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Fcc Acc. Number** | : | (U) Not Applicable |
| **Freq. Stability** | : | (U) 0.3 ppm |
| **Output Device** | : | (U) Transistor |
| **Tuning Method** | : | (U) Synthesizer |
| **Radar/Comm** | : | (U) Communications |
| **Supp. of Harmonics** | : | (U) Yes |

**Figure 11 - 2nd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -80.0 dB | 0.00000 kHz |

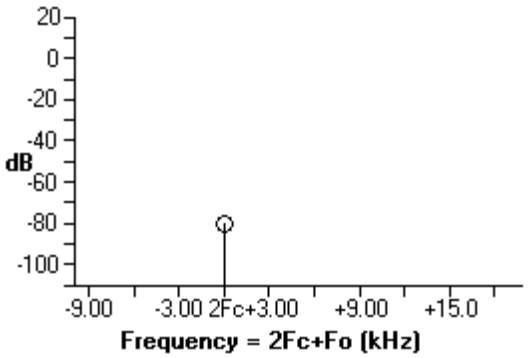


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**Figure 12 - 3rd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -80.0 dB | 0.00000 kHz |

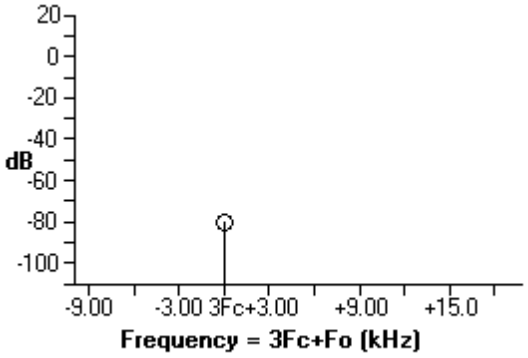


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**Figure 13 - Other Harmonic Curve (U)**

**Atten.** -80.0 dB **Offset (Fo)** 0.00000 kHz

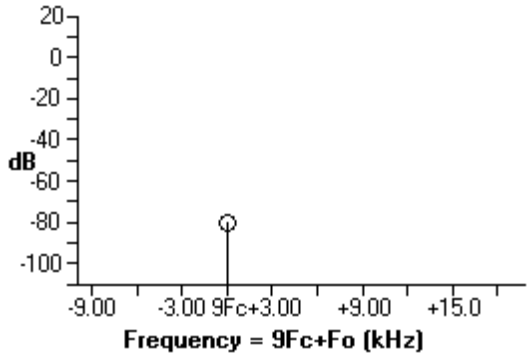


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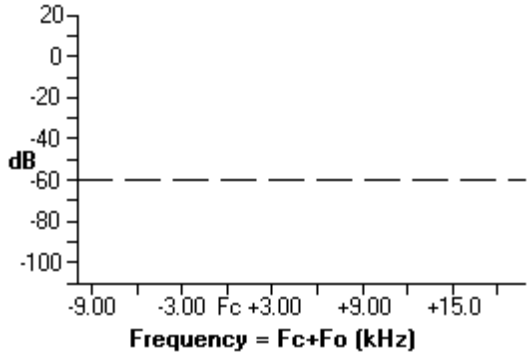
**Figure 14 - Spurious Emission Curve (U)**

**Maximum Spurious Emission**
**Atten.**
-60.0 dB




**(UNCLASSIFIED)**

**Frequencies**

**Tuned Frequency** : (U) 375.00 MHz - 380.00 MHz
**Tuning Increment** : (U) 0.035000 kHz
**# Freq Req.** : (U) 10
**Min. Separation** : (U) 0.025000 MHz
**Em. Designator** : (U) 5M00G1D
**Neccessary BW** : (U) 5000.0 kHz

**Modulation - 5M00G1D**

**Occupied Bandwidth** : (U) 5600.0 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Digital Modulation
**Max. Modulation Frequency** : (U) 240.00 kHz
**Spread Spectrum** : Yes
**Spread Spectrum Type** : (U) Direct Sequence
**Spread Spectrum Chip Rate** : (U) 3840000 /sec

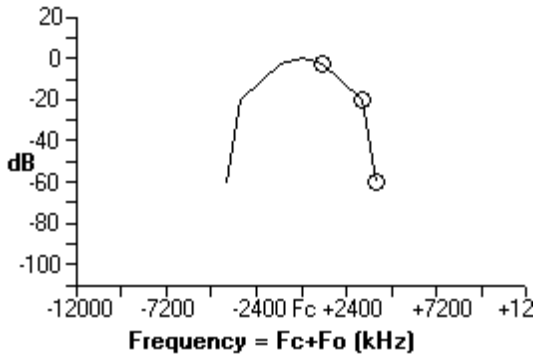
**FULL RECORD PRINT FOR Transmitter**

| | | |
|---|---|---|
| **Information Data Rate** | : | (U) 480000 bps |
| **SS Code Repetition Rate** | : | (U) 3840000 /sec |
| **SS Processing Gain** | : | (U) 11.6 dB |
| **Dig. Modulation Type** | : | (U) GMSK - Gaussian Minimum Shift Keying |
| **Number of Digital States** | : | (U) 2 |
| **Digital Bit Rate** | : | (U) 480000 bps |
| **Deviation Ratio** | : | (U) 1.00 |
| **Digital Peak Deviation** | : | (U) 240.00 kHz |
| **SS Processing Gain** | : | (U) 11.6 dB |

**Figure 15 - Fundamental Curve (U)**

**Meas/Calc** : Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 1100.0 kHz |
| -20.0 dB | 3200.0 kHz |
| -60.0 dB | 4000.0 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 2M50G1D

**Neccessary BW** : (U) 2500.0 kHz

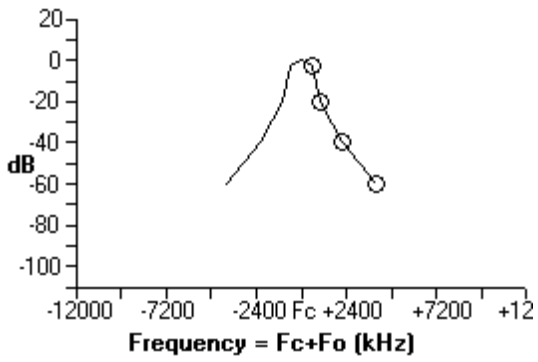
**Modulation - 2M50G1D**

| | | |
|---|---|---|
| **Occupied Bandwidth** | : | (U) 3800.0 kHz |
| **Measured/Calculated** | : | (U) Measured |
| **Radar/Communications** | : | (U) Communications |
| **Modulation Type** | : | (U) Digital Modulation |
| **Max. Modulation Frequency** | : | (U) 1.1735 kHz |
| **Spread Spectrum** | : | Yes |
| **Spread Spectrum Type** | : | (U) Direct Sequence |
| **Spread Spectrum Chip Rate** | : | (U) 1250000 /sec |
| **Information Data Rate** | : | (U) 2347 bps |
| **SS Code Repetition Rate** | : | (U) 1250000 /sec |
| **SS Processing Gain** | : | (U) 27.0 dB |
| **Dig. Modulation Type** | : | (U) OQPSK - Offset Quadrature Phase Shift Keying |
| **Number of Digital States** | : | (U) 4 |
| **Digital Bit Rate** | : | (U) 2347 bps |
| **Deviation Ratio** | : | (U) 2.00 |
| **Digital Peak Deviation** | : | (U) 2.3470 kHz |
| **SS Processing Gain** | : | (U) 27.0 dB |

**Figure 16 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 550.00 kHz |
| -20.0 dB | 1050.0 kHz |
| -40.0 dB | 2200.0 kHz |
| -60.0 dB | 4000.0 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 1M02G1D

**Neccessary BW** : (U) 1020.0 kHz

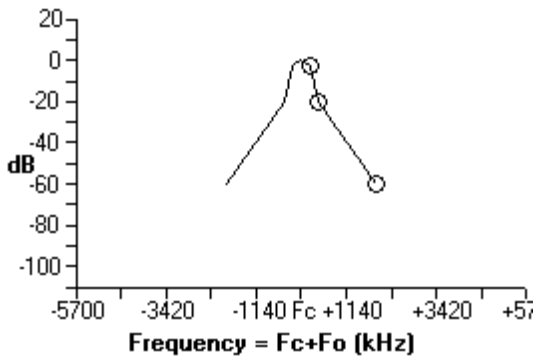
**Modulation - 1M02G1D**

| | | |
|---|---|---|
| **Occupied Bandwidth** | : | (U) 1020.0 kHz |
| **Measured/Calculated** | : | (U) Calculated |
| **Radar/Communications** | : | (U) Communications |
| **Modulation Type** | : | (U) Digital Modulation |
| **Spread Spectrum** | : | Yes |
| **Spread Spectrum Type** | : | (U) Direct Sequence |
| **Spread Spectrum Chip Rate** | : | (U) 1200000 /sec |
| **Information Data Rate** | : | (U) 168750 bps |
| **SS Code Repetition Rate** | : | (U) 1200000 /sec |
| **SS Processing Gain** | : | (U) 8.50 dB |
| **Dig. Modulation Type** | : | (U) GMSK - Gaussian Minimum Shift Keying |
| **Number of Digital States** | : | (U) 2 |
| **Digital Bit Rate** | : | (U) 168750 bps |
| **SS Processing Gain** | : | (U) 8.50 dB |

**Figure 17 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| **Level** | **Offset (Fo)** |
|---|---|
| -3.00 dB | 225.00 kHz |
| -20.0 dB | 453.00 kHz |
| -60.0 dB | 1900.0 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 256KG1D
**Neccessary BW** : (U) 256.00 kHz

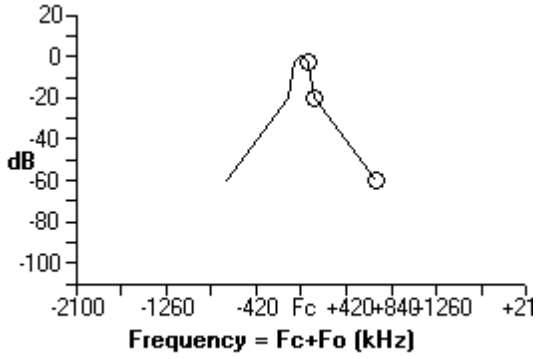
**Modulation - 256KG1D**

| | | |
|---|---|---|
| **Occupied Bandwidth** | : | (U) 256.00 kHz |
| **Measured/Calculated** | : | (U) Calculated |
| **Radar/Communications** | : | (U) Communications |
| **Modulation Type** | : | (U) Digital Modulation |
| **Max. Modulation Frequency** | : | (U) 64.000 kHz |
| **Spread Spectrum** | : | No |
| **Dig. Modulation Type** | : | (U) BPSK - Binary Phase Shift Keying |
| **Number of Digital States** | : | (U) 2 |
| **Digital Bit Rate** | : | (U) 128000 bps |
| **Deviation Ratio** | : | (U) 2.00 |
| **Digital Peak Deviation** | : | (U) 128.00 kHz |

**Figure 18 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| **Level** | **Offset (Fo)** |
|---|---|
| -3.00 dB | 56.500 kHz |
| -20.0 dB | 116.00 kHz |
| -60.0 dB | 700.00 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 64K0G1D
**Neccessary BW** : (U) 64.000 kHz

**Modulation - 64K0G1D**

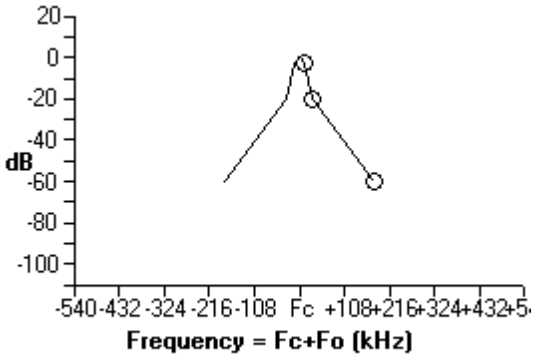
**FULL RECORD PRINT FOR TACSAT-4 Space Payload**

| | | |
|---|---|---|
| **Occupied Bandwidth** | **:** | (U) 64.000 kHz |
| **Measured/Calculated** | **:** | (U) Calculated |
| **Radar/Communications** | **:** | (U) Communications |
| **Modulation Type** | **:** | (U) Digital Modulation |
| **Max. Modulation Frequency** | **:** | (U) 16.000 kHz |
| **Spread Spectrum** | **:** | No |
| **Dig. Modulation Type** | **:** | (U) QPSK - Quadrature Phase Shift Keying |
| **Number of Digital States** | **:** | (U) 4 |
| **Digital Bit Rate** | **:** | (U) 64000 bps |
| **Deviation Ratio** | **:** | (U) 2.00 |
| **Digital Peak Deviation** | **:** | (U) 32.000 kHz |

**Figure 19 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| **Level** | **Offset (Fo)** |
|---|---|
| -3.00 dB | 14.000 kHz |
| -20.0 dB | 29.000 kHz |
| -60.0 dB | 180.00 kHz |




**(UNCLASSIFIED)**

**Powers**

**Power Type :** Mean
**Upper Limit :** (U) 5.00 W

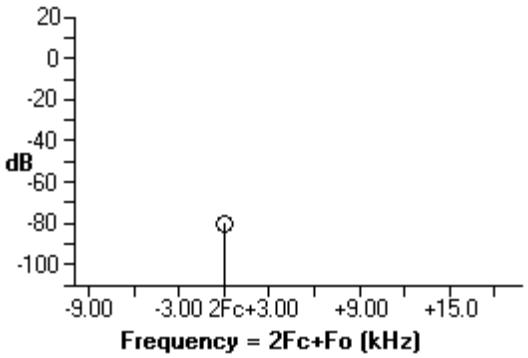
FULL RECORD PRINT FOR TACSAT-4 Space Payload

**TRANSMITTER TacSat- 4 Narrow-Band**

| | | |
|---|---|---|
| **Nomenclature** | : | (U) TacSat- 4 Narrow-Band |
| **Manufacturer** | : | (U) NAVAL RESEARCH LAB |
| **Model Name** | : | (U) TacSat-4 Narrow-Band |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 2/19/2010 8:05:04 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Fcc Acc. Number** | : | (U) Not Applicale |
| **Freq. Stability** | : | (U) 0.3 ppm |
| **Output Device** | : | (U) Transistor |
| **Tuning Method** | : | (U) Synthesizer |
| **Radar/Comm** | : | (U) Communications |
| **Supp. of Harmonics** | : | (U) Yes |

**Figure 20 - 2nd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -80.0 dB | 0.00000 kHz |




**(UNCLASSIFIED)**

**Figure 21 - 3rd Harmonic Curve (U)**

| Atten. | Offset (Fo) |
|---|---|
| -80.0 dB | 0.00000 kHz |

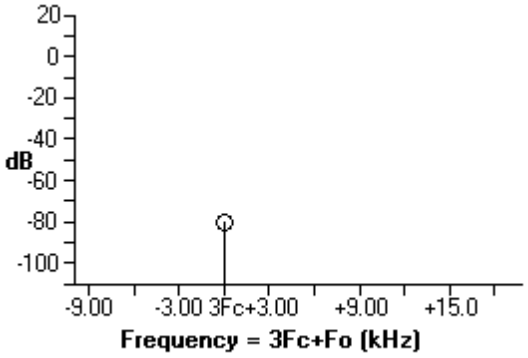



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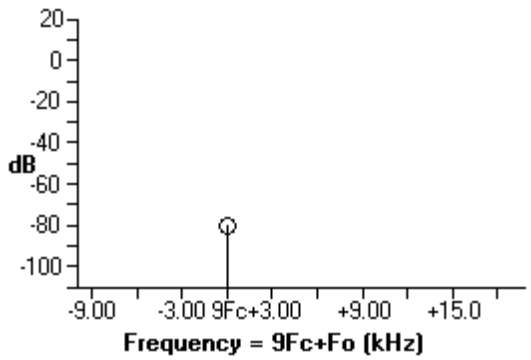
**Figure 22 - Other Harmonic Curve (U)**

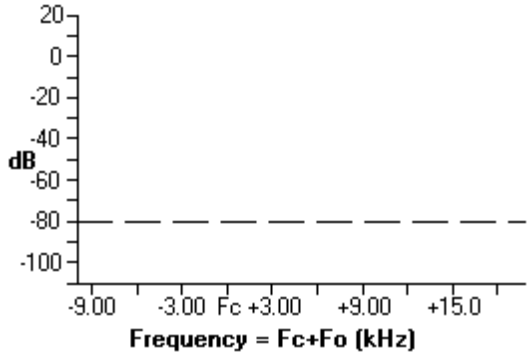
**Atten.** -80.0 dB **Offset (Fo)** 0.00000 kHz




**(UNCLASSIFIED)**

**Figure 23 - Spurious Emission Curve (U)**

**Maximum Spurious Emission**
**Atten.**
-80.0 dB




**(UNCLASSIFIED)**

**Frequencies**

**Tuned Frequency** : (U) 240.00 MHz - 270.00 MHz
**Tuning Increment** : (U) 0.035000 kHz
**# Freq Req.** : (U) 10
**Min. Separation** : (U) 0.025000 MHz
**Em. Designator** : (U) 2K40G1D
**Neccessary BW** : (U) 2.4000 kHz

**Modulation - 2K40G1D**

**Occupied Bandwidth** : (U) 4.3000 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Digital Modulation
**Max. Modulation Frequency** : (U) 1.2000 kHz
**Spread Spectrum** : No
**Dig. Modulation Type** : (U) SBPSK - Shaped Binary Phase Shift Keying
**Number of Digital States** : (U) 2

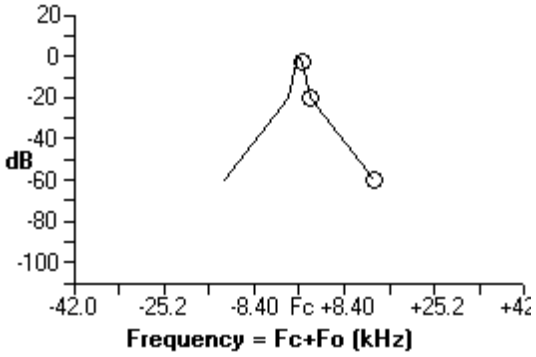
**FULL RECORD PRINT FOR Transmitter**

**Digital Bit Rate** : (U) 1200 bps
**Deviation Ratio** : (U) 2.00
**Digital Peak Deviation** : (U) 2.4000 kHz

**Figure 24 - Fundamental Curve (U)**

**Meas/Calc** : Measured

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 0.40000 kHz |
| -20.0 dB | 2.2000 kHz |
| -60.0 dB | 14.000 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 4K80G1D
**Neccessary BW** : (U) 4.8000 kHz

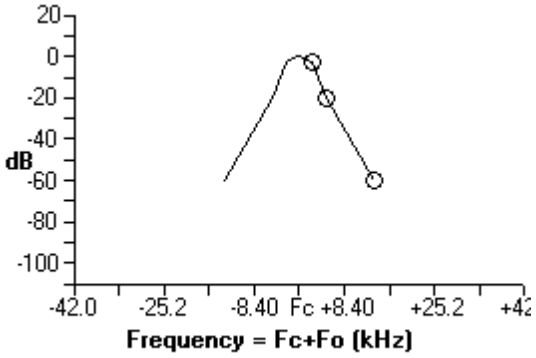
**Modulation - 4K80G1D**

**Occupied Bandwidth** : (U) 11.700 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Digital Modulation
**Max. Modulation Frequency** : (U) 4.0000 kHz
**Spread Spectrum** : No
**Dig. Modulation Type** : (U) SBPSK - Shaped Binary Phase Shift Keying
**Number of Digital States** : (U) 2
**Digital Bit Rate** : (U) 2400 bps
**Deviation Ratio** : (U) 1.00
**Digital Peak Deviation** : (U) 4.0000 kHz

**Figure 25 - Fundamental Curve (U)**

**Meas/Calc** : Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 2.2500 kHz |
| -20.0 dB | 5.0000 kHz |
| -60.0 dB | 14.000 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 16K0F3E

**Neccessary BW** : (U) 16.000 kHz

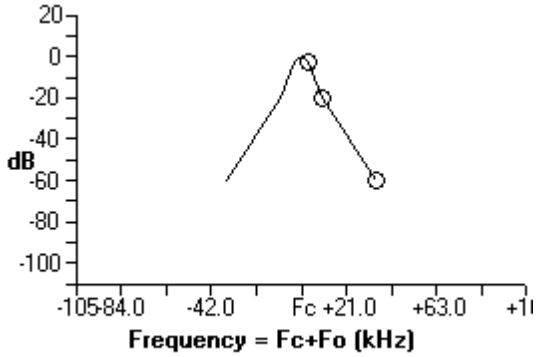
**Modulation - 16K0F3E**

**Occupied Bandwidth** : (U) 18.000 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Analog Modulation (AM, FM, or Phase)
**Spread Spectrum** : No
**Angle Peak Deviation** : (U) 8.0000 kHz
**Angle Deviation Ratio** : (U) 2.00
**Angle Max. Modulation Freq.** : (U) 4.0000 kHz

**Figure 26 - Fundamental Curve (U)**

**Meas/Calc** : Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 3.6000 kHz |
| -20.0 dB | 9.6000 kHz |
| -60.0 dB | 35.000 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 18K5F3E

**Neccessary BW** : (U) 18.500 kHz

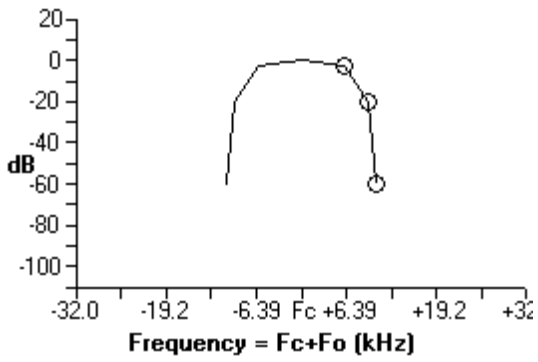
**Modulation - 18K5F3E**

**Occupied Bandwidth** : (U) 21.300 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Analog Modulation (AM, FM, or Phase)
**Spread Spectrum** : No
**Angle Peak Deviation** : (U) 6.5000 kHz
**Angle Deviation Ratio** : (U) 1.63
**Angle Max. Modulation Freq.** : (U) 4.0000 kHz

**Figure 27 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| **Level** | **Offset (Fo)** |
|---|---|
| -3.00 dB | 6.2000 kHz |
| -20.0 dB | 9.6000 kHz |
| -60.0 dB | 10.650 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 22K0F3E
**Neccessary BW** : (U) 22.000 kHz

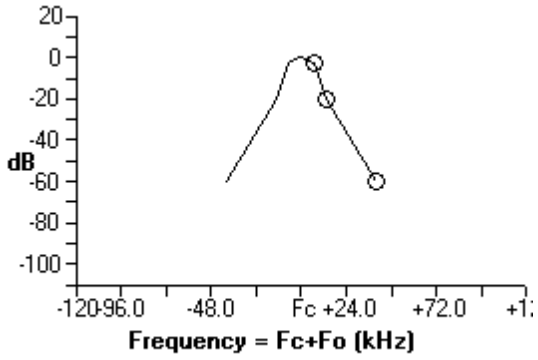
**Modulation - 22K0F3E**

**Occupied Bandwidth** : (U) 24.000 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Analog Modulation (AM, FM, or Phase)
**Spread Spectrum** : No
**Angle Peak Deviation** : (U) 8.0000 kHz
**Angle Deviation Ratio** : (U) 2.00
**Angle Max. Modulation Freq.** : (U) 4.0000 kHz

**Figure 28 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| **Level** | **Offset (Fo)** |
|---|---|
| -3.00 dB | 6.6000 kHz |
| -20.0 dB | 12.950 kHz |
| -60.0 dB | 40.000 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 22K0F1D
**Neccessary BW** : (U) 22.000 kHz

**Modulation - 22K0F1D**

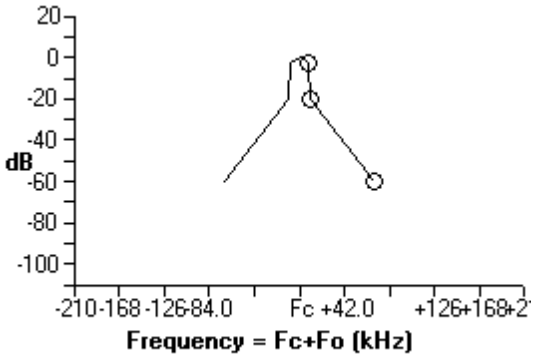
**Occupied Bandwidth** : (U) 22.000 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications

**Modulation Type** : (U) Digital Modulation
**Max. Modulation Frequency** : (U) 8.0000 kHz
**Spread Spectrum** : No
**Dig. Modulation Type** : (U) FSK - Frequency Shift Keying
**Number of Digital States** : (U) 2
**Digital Bit Rate** : (U) 16000 bps
**Deviation Ratio** : (U) 1.00
**Digital Peak Deviation** : (U) 8.0000 kHz

**Figure 29 - Fundamental Curve (U)**

**Meas/Calc** : Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 8.7000 kHz |
| -20.0 dB | 11.000 kHz |
| -60.0 dB | 70.000 kHz |




**(UNCLASSIFIED)**

**Em. Designator** : (U) 25K0G1D
**Neccessary BW** : (U) 25.000 kHz

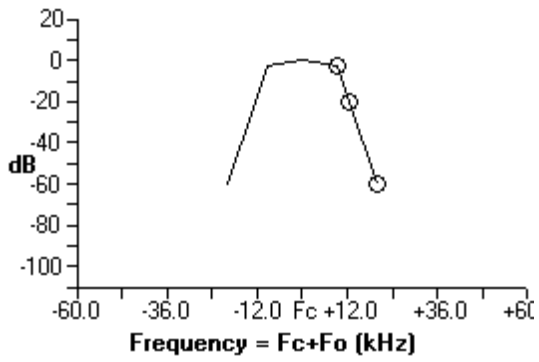
**Modulation - 25K0G1D**

**Occupied Bandwidth** : (U) 25.000 kHz
**Measured/Calculated** : (U) Calculated
**Radar/Communications** : (U) Communications
**Modulation Type** : (U) Digital Modulation
**Max. Modulation Frequency** : (U) 5.3330 kHz
**Spread Spectrum** : No
**Dig. Modulation Type** : (U) QAM - Quadrature Amplitude Modulation
**Number of Digital States** : (U) 64
**Digital Bit Rate** : (U) 64000 bps
**Deviation Ratio** : (U) 2.34
**Digital Peak Deviation** : (U) 12.500 kHz

**Figure 30 - Fundamental Curve (U)**

**Meas/Calc :** Calculated

| Level | Offset (Fo) |
|---|---|
| -3.00 dB | 9.3000 kHz |
| -20.0 dB | 12.500 kHz |
| -60.0 dB | 20.000 kHz |

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**Powers**

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

FULL RECORD PRINT FOR TACSAT-4 Space Payload

**RECEIVER X-Band Receiver**

**Nomenclature** : (U) X-Band Receiver
**Manufacturer** : (U) NAVAL RESEARCH LAB
**Model Name** : (U) X-Band Receiver
**NTIA Approval Status** : (U) Unapproved
**Date/Time Last Mod.** : 2/18/2010 7:37:05 PM (GMT)
**Coordination ID** : (U) J/F 12
**Fcc Acc. Number** : (U) Not Applicable
**Freq. Stability** : (U) 0.3 ppm
**Image Reject** : (U) 60.0dB
**Oscillator Tuned** : (U) Below
**Tuning Method** : (U) Synthesizer
**Cond. Undesired Em.** : (U) -60.0dBm

**Frequencies**

**Fixed Frequency** : (U) 8239.2 MHz

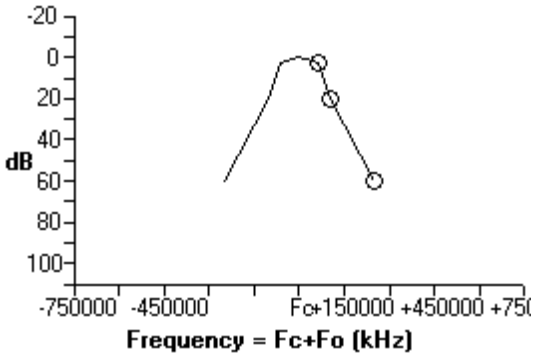
**Sensitivities**

**Em. Designator** : (U) 50M0W9W
**Necessary BW** : (U) 50000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -113 dBm
**Noise Fig.** : (U) 4.11 dB
**Noise Temp.** : (U) 457 K
**Spur. Reject** : (U) 60.0 dB

**Figure 31 - RF Selectivity Curve (U)**

**Meas/Calc** : Calculated

| Atten. | Offset (Fo) |
|---|---|
| 3.00 dB | 61000 kHz |
| 20.0 dB | 101000 kHz |
| 60.0 dB | 250000 kHz |

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FULL RECORD PRINT FOR TACSAT-4 Space Payload

**RECEIVER Model TR-400 (ODTML)**

**Nomenclature** : (U) Model TR-400 (ODTML)
**Manufacturer** : (U) SPACEQUEST LTD.
**Model Name** : (U) Model TR-400 (ODTML)
**NTIA Approval Status** : (U) Unapproved
**Date/Time Last Mod.** : 2/18/2010 7:20:18 PM (GMT)
**Coordination ID** : (U) J/F 12
**Fcc Acc. Number** : (U) Not Applicable
**Freq. Stability** : (U) 1.5 ppm
**Image Reject** : (U) 70.0dB
**Oscillator Tuned** : (U) Below
**Tuning Method** : (U) PLL Synthesizer
**Cond. Undesired Em.** : (U) -60.0dBm

**Frequencies**

**Fixed Frequency** : (U) 401.05 MHz

**Sensitivities**

**Em. Designator** : (U) 6K48F1D
**Necessary BW** : (U) 6.4800 kHz
**Perf. Crit.** : (U) SINAD - Signal+Noise+ Distortion-to-Noise+ Distortion Ratio (dB)
**Perf. Value** : (U) 12
**Sensitivity** : (U) -118 dBm
**Noise Fig.** : (U) 3.50 dB
**Noise Temp.** : (U) 359 K
**Spur. Reject** : (U) 70.0 dB

**Figure 32 - IF Selectivity Curve (U)**

**IF Freq. (Fk)** : 43.650 MHz
**Meas/Calc** : Calculated

| Atten. | Offset (Fo) |
|---|---|
| 3.00 dB | 6.0000 kHz |
| 20.0 dB | 25.000 kHz |

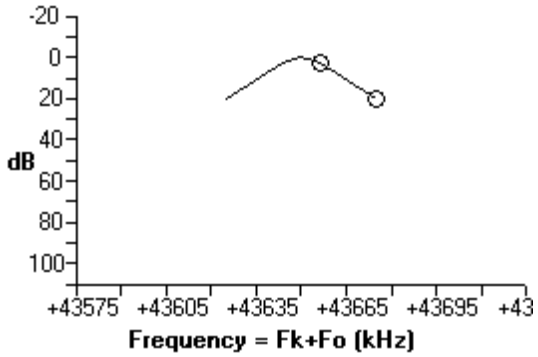


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**Figure 33 - IF Selectivity Curve (U)**

**IF Freq. (Fk) :** 0.45000 MHz
**Meas/Calc :** Calculated

| **Atten.** | **Offset (Fo)** |
|---|---|
| 3.00 dB | 6.0000 kHz |
| 20.0 dB | 7.5000 kHz |
| 60.0 dB | 12.500 kHz |

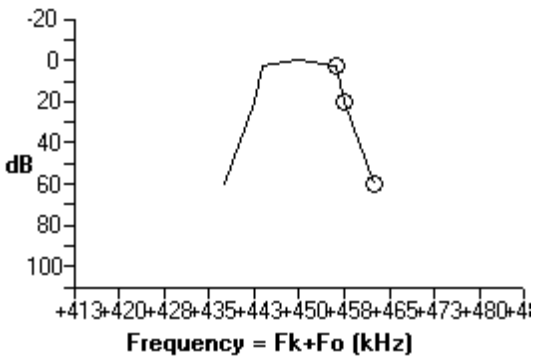


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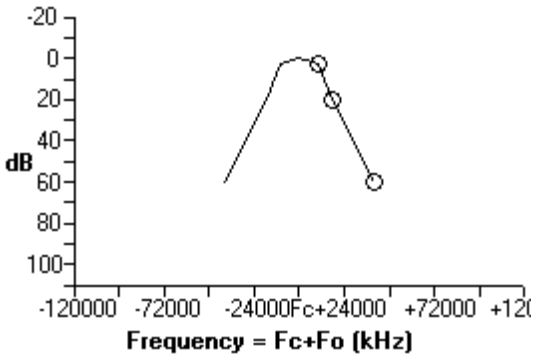
**Figure 34 - RF Selectivity Curve (U)**

**Meas/Calc :** Calculated

| **Atten.** | **Offset (Fo)** |
|---|---|
| 3.00 dB | 10000 kHz |
| 20.0 dB | 18000 kHz |
| 60.0 dB | 40000 kHz |




**(UNCLASSIFIED)**

FULL RECORD PRINT FOR TACSAT-4 Space Payload

**RECEIVER TacSat-4 UHF**

**Nomenclature** : (U) TacSat-4 UHF
**Manufacturer** : (U) NAVAL RESEARCH LAB
**Model Name** : (U) TacSat-4 UHF
**NTIA Approval Status** : (U) Unapproved
**Date/Time Last Mod.** : 2/18/2010 7:28:19 PM (GMT)
**Coordination ID** : (U) J/F 12
**Fcc Acc. Number** : (U) Not Applicable
**Freq. Stability** : (U) 0.03 ppm
**Image Reject** : (U) 60.0dB
**Oscillator Tuned** : (U) Below
**Tuning Method** : (U) Synthesizer
**Cond. Undesired Em.** : (U) -60.0dBm

**Frequencies**

**Tuned Frequency** : (U) 292.00 MHz - 412.00 MHz
**Tuning Increment** : (U) 0.035000 kHz

**Sensitivities**

**Em. Designator** : (U) 5M00G1D
**Necessary BW** : (U) 5000.0 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**

**Em. Designator** : (U) 2M50G1D
**Necessary BW** : (U) 2500.0 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**

**Em. Designator** : (U) 1M02G1D
**Necessary BW** : (U) 1020.0 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**

**Em. Designator** : (U) 256KG1D
**Necessary BW** : (U) 256.00 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10

**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 64K0G1D
**Necessary BW** : (U) 64.000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 25K0G1D
**Necessary BW** : (U) 25.000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 22K0G1D
**Necessary BW** : (U) 22.000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 22K0F3E
**Necessary BW** : (U) 22.000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 22K0F1D
**Necessary BW** : (U) 22.000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB

**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 18K5F3E
**Necessary BW** : (U) 18.500 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 16K0F3E
**Necessary BW** : (U) 16.000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

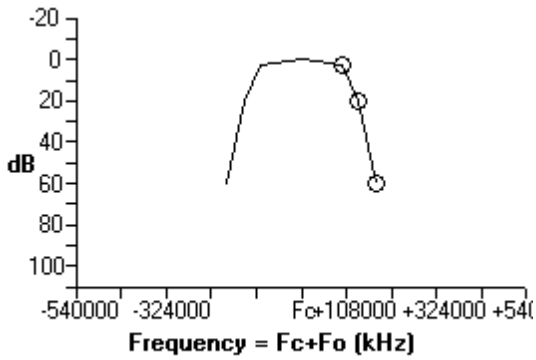
**Sensitivities**
**Em. Designator** : (U) 4K80G1D
**Necessary BW** : (U) 4.8000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Sensitivities**
**Em. Designator** : (U) 2K40G1D
**Necessary BW** : (U) 2.4000 kHz
**Perf. Crit.** : (U) S/N - Signal to Noise Ratio (dB)
**Perf. Value** : (U) 10
**Sensitivity** : (U) -117 dBm
**Noise Fig.** : (U) 4.75 dB
**Noise Temp.** : (U) 575 K
**Spur. Reject** : (U) 60.0 dB

**Figure 35 - RF Selectivity Curve (U)**

**Meas/Calc :** Calculated

| **Atten.** | **Offset (Fo)** |
|---|---|
| 3.00 dB | 100000 kHz |
| 20.0 dB | 135000 kHz |
| 60.0 dB | 180000 kHz |




**(UNCLASSIFIED)**

FULL RECORD PRINT FOR TACSAT-4 Space Payload

## ANTENNA X-2

| | | |
|---|---|---|
| **Nomenclature** | : | (U) X-2 |
| **Antenna Code** | : | Aperture |
| **Manufacturer** | : | (U) NAVAL RESEARCH LAB |
| **Model Name** | : | (U) X-2 |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 2/18/2010 7:54:57 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Lower Freq. Limit** | : | (U) 8215.0 MHz |
| **Upper Freq. Limit** | : | (U) 8263.0 MHz |
| **Polarization** | : | (U) Right Hand Circular |
| **Main Beam Gain** | : | (U) 25.2 dBi |
| **1st Horz. Sidelobe Atten.** | : | (U) 0.000 dB |
| **Atten. Rel/Act** | : | (U) Relative dB |
| **Horz. Beamwidth** | : | (U) 17.0 degrees |
| **Vert. Beamwidth** | : | (U) 17.0 degrees |
| **Horz. Scan Type** | : | (U) Fixed |
| **Horz. Scan Type** | : | (U) Fixed |
| **Vert. Scan Type** | : | (U) Fixed |
| **Dish Diameter** | : | (U) 0.152 meters |

FULL RECORD PRINT FOR TACSAT-4 Space Payload

## ANTENNA X

| | | |
|---|---|---|
| **Nomenclature** | : | (U) X |
| **Antenna Code** | : | Aperture |
| **Manufacturer** | : | (U) NAVAL RESEARCH LAB |
| **Model Name** | : | (U) X-Band Horn |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 2/18/2010 7:52:21 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Lower Freq. Limit** | : | (U) 7565.0 MHz |
| **Upper Freq. Limit** | : | (U) 7613.0 MHz |
| **Polarization** | : | (U) Left Hand Circular |
| **Main Beam Gain** | : | (U) 19.4 dBi |
| **1st Horz. Sidelobe Level** | : | (U) 0.000 dB |
| **Atten. Rel/Act** | : | (U) Actual dBi |
| **Horz. Beamwidth** | : | (U) 16.0 degrees |
| **Vert. Beamwidth** | : | (U) 16.0 degrees |
| **Horz. Scan Type** | : | (U) Fixed |
| **Horz. Scan Type** | : | (U) Fixed |
| **Vert. Scan Type** | : | (U) Fixed |
| **Dish Diameter** | : | (U) 1.83 meters |

FULL RECORD PRINT FOR TACSAT-4 Space Payload

## ANTENNA UHF

| | | |
|---|---|---|
| **Nomenclature** | : | (U) UHF |
| **Antenna Code** | : | Aperture |
| **Manufacturer** | : | (U) NAVAL RESEARCH LAB |
| **Model Name** | : | (U) UHF |
| **NTIA Approval Status** | : | (U) Unapproved |
| **Date/Time Last Mod.** | : | 2/18/2010 7:49:19 PM (GMT) |
| **Coordination ID** | : | (U) J/F 12 |
| **Lower Freq. Limit** | : | (U) 240.00 MHz |
| **Upper Freq. Limit** | : | (U) 420.00 MHz |
| **Polarization** | : | (U) Right Hand Circular |
| **Main Beam Gain** | : | (U) 20.0 dBi |
| **1st Horz. Sidelobe Atten.** | : | (U) 0.600 dB |
| **Atten. Rel/Act** | : | (U) Relative dB |
| **1st Horz. Pos.** | : | (U) 17.0 degrees |
| **Horz. Beamwidth** | : | (U) 20.0 degrees |
| **Vert. Beamwidth** | : | (U) 20.0 degrees |
| **Horz. Scan Type** | : | (U) Fixed |
| **Horz. Scan Type** | : | (U) Fixed |
| **Vert. Scan Type** | : | (U) Fixed |
| **Dish Diameter** | : | (U) 3.66 meters |

## Line Diagram: TACSAT-4 Space Payload