

Spectrum Certification / Equipment Characteristics Cover Page

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DoD General Information

Estimated Initial Cost of the System (U) \$1,000**Target Date for**

Application Approval: (U) 19 Jan 2018

System Activation: (U) 20 Jan 2018

System Termination: (U) 19 Jan 2023

System Relationship and Essentiality

(U) Point-to-point radio system to reinforce safe operation of armed air vehicle on flight test range.
Provides independent ability to terminate flight of operational armed air vehicle.

Replacement Information

(U) Original implementation. Not replacing any other existing system.

Related Analysis and/or Test Data

(U) NAvail

NTIA Coordination Required Yes**ITU Waiver** (U) No**Originating MILDEP** (U) AR**Other Using MILDEPs****Names and Telephone Numbers**

Program Manager (U)

Name: Guthre Wallace

Commercial: 256-655-3081

DSN:

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Project Engineer (U)

Name: Chris Troudt

Commercial: 520-434-6325

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Email: Christopher.D.Troudt@raytheon.com

Station Details

Name: (U) Ground Station

Type: (U) Land

Location(s): (U) Yuma Proving Ground, Arizona

Description:

Name: (U) UAS

Type: (U) Airborne

Location(s): (U) Yuma Proving Ground, Arizona

Description: (U) Aircraft

Frequency Requirement Details

Frequency Requirement 1

Tx 1 - Ant 1

Tx 1 - Ant 2

Tx 2 - Ant 3

Remarks

Transmitter Equipment Characteristics #1

Nomenclature: (U) EzUHF Transmitter

Type: Commercial

Manufacturer: (U) Immersion RC

Transmitter Installation

Installation Type: (U) Land Fixed

Potential Platform: (U) UAS Ground Station

Transmitter Type: (U) FM and FSK Communications**Tuning Range**

(U) 430 - 450 MHz

This is a summary of Tuning Ranges in the modes.

Method of Tuning: (U) Synthesizer PLL

This Tuning Method is used by every mode.

Frequency Tolerance: (U) 15 ppm

This Frequency Tolerance is used by every mode.

Filter Employed (U) NA**Output Device**

Type: (U) Transistor

Name: (U) NA

FCC Type Acceptance No.: (U) NA**Pre-Emphasis:** (U) No**Mode 1 - (U) 40K0F1D****Name:**[See Remark 1 \(Page 3\)](#)

Tuning Range

Tuning Step

Num Channels

Lowest Usable Channel

Min. Separation

Num Frequencies

(U) 430 - 450 MHz

(U) 500 kHz

(U) 8

(U) 431 MHz

(U) 1 MHz

Method of Tuning: (U) Synthesizer PLL

Emission Bandwidth

Emission Bandwidth Source: Measured

-3 dB: (U) 30 kHz

-20 dB: (U) 40 kHz

-40 dB: (U) 60 kHz

-60 dB: (U) 400 kHz

Occupied Bandwidth: (U) 40 kHz

Occupied Bandwidth Source: Measured

Modulation Type: (U) Digital

Power

Mean Low: (U) NA

Mean High: (U) 2 W

PEP Low: (U) NA

PEP High:

Carrier Low: (U) NA

Carrier High:

Baseband Signal Type: (U) FSK

Max. Modulation Frequency: (U) NA

Min.: (U) NA

Modulation

Digital Modulation Type: (U) FSK

Max. Bit Rate: (U) 30 kbps

Spread Spectrum

Spread Spectrum Type: (U) Frequency hopped

Frequency Range: (U) 430 - 450 MHz

Number of Frequencies: (U) NA

Frequency Tolerance: (U) 15 ppm

Harmonic Level

2nd Harmonic: (U) -40 dB

3rd Harmonic: (U) -60 dB

Other Harmonic: (U) -60 dB

Spurious Emission: (U) -60 dB

Remarks

Remark 1 (Mode 1):

(U) Number of Frequencies: Spread spectrum uses "extreme hopping" mode for channel hopping patterns within tuning range.

Transmitter Equipment Characteristics #2

Nomenclature: (U) TSC 287000

Type: Commercial

Manufacturer: (U) TECHNOLOGY SERVICE CORP.

Transmitter Installation

Installation Type: (U) Air

Potential Platform: (U) Unmanned Aircraft System (UAS)

Transmitter Type: (U) FM CW**Tuning Range**

(U) 6750 - 8000 MHz

This is a summary of Tuning Ranges in the modes.

Method of Tuning: (U) Oscillator Voltage Controlled

This Tuning Method is used by every mode.

Frequency Tolerance: (U) 25 ppm

This Frequency Tolerance is used by every mode.

Filter Employed**Output Device**

Type: (U) Transistor

Name: (U) Monolithic Microwave Integrated Circuit

FCC Type Acceptance No.: (U) NA**Pre-Emphasis:** (U) No**Mode 1 - (U) 600MF3N****Name:**[See Remark 1 \(Page 4\)](#)

Tuning Range

Tuning Step

Num Channels

Lowest Usable Channel

Min. Separation

Num Frequencies

(U) 6750 - 8000 MHz

(U) NA

(U) NA

(U) 6.75 GHz

(U) NA

(U) NA

Method of Tuning: (U) Oscillator Voltage Controlled

Emission Bandwidth

Emission Bandwidth Source: Calculated

-3 dB: (U) 608 MHz

-20 dB: (U) 615 MHz

-40 dB: (U) 669 MHz

-60 dB: (U) 1.054 GHz

Occupied Bandwidth: (U) 601 MHz

Occupied Bandwidth Source: Calculated

Modulation Type: (U) Digital

Power

Mean Low: (U) NA

Mean High: (U) 10 W

PEP Low: (U) NA

PEP High:

Carrier Low: (U) NA

Carrier High:

Baseband Signal Type: (U) FM-CW

Max. Modulation Frequency: (U) 585 MHz

Min.:

Frequency Tolerance: (U) 25 ppm

Harmonic Level

2nd Harmonic: (U) -60 dB

3rd Harmonic: (U) -60 dB

Other Harmonic: (U) -60 dB

Spurious Emission: (U) -60 dB

Remarks

Remark 1 (Mode 1):

(U) Remark 1 (Nomenclature 1):

(U) Technology Service Corporation Terminal Guidance Seeker TSC 287000

Remark 2 (Mode 1):

(U) Item 12a-d: This is an FM-CW waveform that is either on or off.

Item 21c: Harmonics greater than the third (3rd) are not capable of being accurately measured with existing laboratory equipment.

Receiver Equipment Characteristics #1

Nomenclature: (U) EzUHF 8 Channel Diversity Receiver

Type: Commercial

Manufacturer: (U) Immersion RC

Receiver Installation

Installation Type: (U) Unmanned Aircraft System (UAS)

Potential Platform: (U) Aircraft

Receiver Type (U) Other**Tuning Range**

(U) 430 MHz

This is a summary of Tuning Ranges in the modes.

Method of Tuning: (U) Synthesizer PLL

This Tuning Method is used by every mode.

Frequency Tolerance: (U) 15 ppm

This Frequency Tolerance is used by every mode.

Preselection Type: (U) Front end bandpass filter**Conducted Emissions:****FCC Type Acceptance No.:** (U) NA**De-Emphasis:****Mode 1 - (U) 40K0F1D****Name:**[See Remark 1 \(Page 5\)](#)

Tuning Range	Tuning Step	Num Channels	Lowest Usable Channel	Min. Separation	Num Frequencies
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(U) 430 MHz	(U) 450 MHz				
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Method of Tuning: (U) Synthesizer PLL

Max. Post Detection Frequency: (U) NA Min.: (U) NA

Max. Bit Rate: (U) 30 kbps

Frequency Tolerance: (U) 15 ppm

Sensitivity

Level: (U) -112 dBm

Criteria Type: (U) S/N

Criteria Level: (U) 5.5

Noise Figure: (U) 5 dB

IF Frequency

1st Stage:

2nd Stage:

3rd Stage:

Oscillator Tuned

1st Stage:

2nd Stage:

3rd Stage:

IF Selectivity	1st Stage	2nd Stage	3rd Stage
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-3 dB:

-20 dB:

-60 dB:

Source:

RF Selectivity

-3 dB: (U) 400 kHz

-20 dB: (U) 650 kHz

-60 dB: (U) 1.4 MHz

Source: Calculated

Image Rejection: (U) NA

Spurious Rejection: (U) 60 dB

Remarks

Remark 1 (Mode 1):

(U) Lowest Usable Channel: 431 MHz

Min Separation: 1 MHz

Number Frequencies: NA; Frequency hopping.

Receiver Equipment Characteristics #2

Nomenclature: (U) Terminal Guidance Seeker Receiver: TSC 287000

Type: Commercial

Manufacturer: (U) TECHNOLOGY SERVICE CORP.

Receiver Installation

Installation Type: (U) Unmanned Aircraft System (UAS)

Potential Platform: (U) Unmanned Aircraft System (UAS)

Receiver Type (U) Homodyne**Tuning Range**

(U) 6750 - 8000 MHz

This is a summary of Tuning Ranges in the modes.

Method of Tuning: (U) Oscillator Voltage Controlled

This Tuning Method is used by every mode.

Frequency Tolerance: (U) 25 ppm

This Frequency Tolerance is used by every mode.

Preselection Type: (U) NA**Conducted Emissions:****FCC Type Acceptance No.:** (U) NA**De-Emphasis:** (U) No**Mode 1 - (U) 600MF3N****Name:**[See Remark 1 \(Page 6\)](#)

Tuning Range	Tuning Step	Num Channels	Lowest Usable Channel	Min. Separation	Num Frequencies
(U) 6750 - 8000 MHz	(U) NA	(U) NA	(U) NA	(U) NA	(U) NA

Method of Tuning: (U) Oscillator Voltage Controlled

Max. Post Detection Frequency: (U) 1.3 MHz Min.: (U) 150 kHz

Max. Bit Rate: (U) NA

Frequency Tolerance: (U) 25 ppm

Sensitivity

Level: (U) -120 dBm

Criteria Type: (U) S/N

Criteria Level: (U) 20

Noise Figure: (U) 2 dB

Noise Temperature: (U) 290 kelvins

IF Frequency

1st Stage:

2nd Stage:

3rd Stage:

Oscillator Tuned

1st Stage:

2nd Stage:

3rd Stage:

IF Selectivity

1st Stage

2nd Stage

3rd Stage

-3 dB:

-20 dB:

-60 dB:

Source:

RF Selectivity

-3 dB: (U) 1 MHz

-20 dB: (U) 1.2 MHz

-60 dB: (U) 1.5 MHz

Source: Calculated

Image Rejection: (U) 0 dB

Spurious Rejection: (U) 60 dB

Remarks

Remark 1 (Mode 1):

(U) Remark 1 (Nomenclature 1):
(U) Technology Service Corporation

Remark 2 (Mode 1):

(U) Item 10 & 12: There is no intermediate frequency.

The system is a Homodyne (direct Conversion) receiver with a baseband filter that has break points at 1 MHz (-3dB), 1.2 MHz (-20 dB) and 1.5 MHz (-60 dB).

Receiver Equipment Characteristics #2

Classification: UNCLASSIFIED - Special Handling	J/F 12/
Antenna Equipment Characteristics #1	

Nomenclature: (U) ZDADJ430-9YG Type: Commercial Manufacturer: (U) ZDA Communications US LLC	
Antenna Type: (U) Yagi-Unidirectional Array	
Frequency Range (U) 430 - 450 MHz This is a summary of Frequency Ranges in the modes.	
Phased Array	
Number of Main Beams:	Elements:
Sidelobes	
1st Vertical Side Lobe Attenuation:	(U) 10 dB
1st Vertical Side Lobe Elevation:	(U) 52 deg
1st Horizontal Side Lobe Attenuation:	(U) 10 dB
1st Horizontal Side Lobe Azimuth:	(U) 45 deg
Antenna Dimensions	
Vertical:	
Horizontal:	
Diameter:	
Mode 1	Name:
Function:	(U) Transmit Only
Frequency Range:	(U) 430 - 450 MHz
Gain:	(U) 9 dBi
Polarization Type:	(U) Horizontal linear
Scan Characteristics	Front-to-back Ratio:
Vertical	Horizontal
Type:	Type:
Min. Elevation Angle:	Sector:
Max. Elevation Angle:	Scan Rate:
Scan Rate:	Scan Speed:
Scan Speed:	
Sector Blanking:	
Horizontal Beamwidth:	(U) 68 deg
Vertical Beamwidth:	(U) 52 deg
Remarks	

Antenna Equipment Characteristics #2

Nomenclature: (U) ANT-433MR

Type: Commercial

Manufacturer: (U) LPRS

Antenna Type: (U) Whip**Frequency Range**

(U) 430 - 470 MHz

This is a summary of Frequency Ranges in the modes.

Phased Array

Number of Main Beams:

Elements:

Sidelobes

1st Vertical Side Lobe Attenuation: (U) NA dB

1st Vertical Side Lobe Elevation: (U) NA deg

1st Horizontal Side Lobe Attenuation: (U) NA dB

1st Horizontal Side Lobe Azimuth: (U) NA deg

Antenna Dimensions

Vertical:

Horizontal:

Diameter:

Mode 1**Name:**

Function: (U) Receive Only

Frequency Range: (U) 430 - 470 MHz

Gain: (U) 3 dBi

Front-to-back Ratio:

Polarization Type: (U) Horizontal linear

Scan Characteristics

Vertical

Horizontal

Type:

Type:

Min. Elevation Angle:

Sector:

Max. Elevation Angle:

Scan Rate:

Scan Rate:

Scan Speed:

Scan Speed:

Sector Blanking:

Horizontal Beamwidth: (U) 360 deg

Vertical Beamwidth: (U) 360 deg

Remarks

Antenna Equipment Characteristics #3

Nomenclature: (U) Terminal Guidance Seeker Antenna: TSC 287000

Type: Commercial

Manufacturer: (U) TECHNOLOGY SERVICE CORP.

Antenna Type: (U) Dipole**Frequency Range**

(U) 6750 - 8000 MHz

This is a summary of Frequency Ranges in the modes.

Phased Array

Number of Main Beams:

Elements:

Sidelobes

1st Vertical Side Lobe Attenuation: (U) NA dB

1st Vertical Side Lobe Elevation: (U) NA deg

1st Horizontal Side Lobe Attenuation: (U) NA dB

1st Horizontal Side Lobe Azimuth: (U) NA deg

Antenna Dimensions

Vertical:

Horizontal:

Diameter:

Mode 1**Name:**

Function: (U) Transmit-Receive

Frequency Range: (U) 6750 - 8000 MHz

Gain: (U) 7 dBi

Front-to-back Ratio:

Polarization Type: (U) Linear

Scan Characteristics**Vertical**

Type:

Min. Elevation Angle:

Max. Elevation Angle:

Scan Rate:

Scan Speed:

Sector Blanking:

Horizontal

Type:

Sector:

Scan Rate:

Scan Speed:

Horizontal Beamwidth: (U) 50 deg

Vertical Beamwidth: (U) 80 deg

Remarks

Remark 1 (Antenna):

(U) This Antenna is part of the Transmitter 2 and Receiver 2.