

UNCLASSIFIED		
SECURITY SUMMARY & SPECIAL HANDLING REQUIREMENTS		
The Application Title is : TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950) The System Name is : TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)		
The overall classification of this application is : UNCLASSIFIED Refer to your Security Manual for further guidance.		
The Application Level Special Handling is : P Proprietary; otherwise, not releasable outside the US Government IAW Section 552 (b)(1) of Title 5 US Code.		
DOWNGRADING INSTRUCTIONS		
Special Handling Instruction : P		CLASSIFICATION UNCLASSIFIED

APPLICATION FOR EQUIPMENT FREQUENCY ALLOCATION		CLASSIFICATION UNCLASSIFIED		DATE 4/25/2018		PAGE 2	
DOD GENERAL INFORMATION							
TO (U) Army Spectrum Management Office (ASMO) 6916 Cooper Avenue, Fort Meade, MD 20755-9701				FROM (U) PdM Waveforms SFAE-CCC-TRW 6560 Surveillance Loop, Bldg 6007 Aberdeen Proving Ground, Maryland 21005			
1. APPLICATION TITLE (U) TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)							
2. SYSTEM NOMENCLATURE (U) TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)							
3. STAGE OF ALLOCATION (U) ☐ a. STAGE 1 CONCEPTUAL ☐ b. STAGE 2 EXPERIMENTAL ☐ c. STAGE 3 DEVELOPMENTAL ☒ d. STAGE 4 OPERATIONAL							
4. FREQUENCY REQUIREMENTS a. FREQUENCY(IES) b. EMISSION DESIGNATORS							
5. TARGET STARTING DATE FOR SUBSEQUENT STAGES							
a. STAGE 2		b. STAGE 3			c. STAGE 4 (U) 6/29/2018		
6. EXTENT OF USE (U) Intermittent use of mesh network capabilities for demonstration and (See Data Overflow Page)							
7. GEOGRAPHICAL AREA FOR							
a. STAGE 2							
b. STAGE 3							
c. STAGE 4 (U) US&P - Polygon							
8. NUMBER OF UNITS							
a. STAGE 2		b. STAGE 3			c. STAGE 4 (U) 250		
9. NUMBER OF UNITS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT (U) 250							
10. OTHER J/F 12 APPLICATION ID(S) TO BE ☐ a. SUPERSEDED ☐ b. RELATED				11. IS THERE ANY OPERATIONAL REQUIREMENT AS DESCRIBED IN THE INSTRUCTIONS FOR PARAGRAPH 11? ☐ a. YES ☐ b. NO ☐ c. NAVAIL			
12. NAMES AND TELEPHONE NUMBERS (See Data Overflow Page)							
(U) Sayeed Hasan, Ph. D. Chief Engineer							
13. REMARKS (U) (U) See TrellisWare document titled "TSM Network Scalability Test Report" from 8/28/2017 for example of capability and scalability. (U) Item 4a. Radios support the following frequency ranges: 225-450 MHz, 690-970 MHz, 1250-2620 MHz.							
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DOD DATA OVERFLOW PAGE		
6. EXTENT OF USE Cont. (U) specific exercise.		
12. NAMES AND TELEPHONE NUMBERS Cont. (U) PdM Waveforms, PM Tactical Radios, PEO C3T Desk: 443-395-2626 Mobile: 443-252-1865		
13. REMARKS (U) Item 4b. Radios support the following emission designators: 1M20G1D, 3M60G1D, 10M0G1D, 20M0G1D		
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APPLICATION FOR FOREIGN SPECTRUM SUPPORT		CLASSIFICATION UNCLASSIFIED	PAGE 4
FOREIGN COORDINATION GENERAL INFORMATION			
1. APPLICATION TITLE (U) TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)			
2. SYSTEM NOMENCLATURE (U) TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)			
3. STAGE OF ALLOCATION (U) ☐ a. STAGE 1 CONCEPTUAL ☐ b. STAGE 2 EXPERIMENTAL ☐ c. STAGE 3 DEVELOPMENTAL ☒ d. STAGE 4 OPERATIONAL			
4. FREQUENCY REQUIREMENTS a. FREQUENCY(IES) b. EMISSION DESIGNATORS			
5. PROPOSED OPERATING LOCATIONS OUTSIDE US&P (U) US&P			
6. PURPOSE OF SYSTEM, OPERATIONAL AND SYSTEM CONCEPTS (U) Provide for the mobile mesh networking dissemination of voice, video and data traffic in tactical environments.			
7. INFORMATION TRANSFER REQUIREMENTS (U) Ability to transmit voice, streaming video and IP data over multiple hops.			
8. NUMBER OF UNITS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT (U) 250			
9. REPLACEMENT INFORMATION (U) NA			
10. LINE DIAGRAM None		11. SPACE SYSTEMS	
12. PROJECTED OPERATIONAL DEPLOYMENT DATE (U) 6/29/2018			
13. REMARKS (U) (U) See TrellisWare document titled "TSM Network Scalability Test Report" from 8/28/2017 for example of capability and scalability. (U) Item 4a. Radios support the following frequency ranges: 225-450 MHz, 690-970 MHz, 1250-2620 MHz. (U) Item 4b. Radios support the following emission designators: 1M20G1D, 3M60G1D, 10M0G1D, 20M0G1D			
DOWNGRADING INSTRUCTIONS Special Handling Instruction : P		CLASSIFICATION UNCLASSIFIED	

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TRANSMITTER EQUIPMENT CHARACTERISTICS			
1. NOMENCLATURE, MANUFACTURER'S MODEL NO. (U) TSM Radio, (U) TW-650 Core RF Module		2. MANUFACTURER'S NAME (U) TRELLISWARE TECHNOLOGIES INC.	
3. TRANSMITTER INSTALLATION (U) Portable, handheld		4. TRANSMITTER TYPE (U) Phase Modulation Communications	
5. TUNING RANGE (U) 1250.600 - 2619.400 MHz (U) 225.6000 - 449.4000 MHz (See Data Overflow Page)		6. METHOD OF TUNING (U) Synthesizer	
7. RF CHANNELING CAPABILITY (U) 5.0000 kHz Increments (U) 5.0000 kHz Increments (See Data Overflow Page)		8. EMISSION DESIGNATORS (U) 10M0G1D (See Data Overflow Page)	
9. FREQUENCY TOLERANCE (U) 0.5 ppm		12. EMISSION BANDWIDTH ☐ CALCULATED ☒ MEASURED	
10. FILTER EMPLOYED (U) Tunable BPF + Harmonic LPF			
11. SPREAD SPECTRUM ☐ a. YES ☒ b. NO		a. -3 dB (U) 5000 kHz (U) 5000 kHz	
		b. -20 dB (U) 12800 kHz (U) 12800 kHz	
		c. -40 dB (U) 22400 kHz (U) 22400 kHz	
		d. -60 dB (U) 30400 kHz (U) 30400 kHz	
		e. OC-BW (U) 12000 kHz (U) 12000 kHz	
13. MAXIMUM BIT RATE (U) 40000000 bps		15. MAXIMUM MODULATION FREQUENCY	
14. MODULATION TECHNIQUES AND CODING (U) Digital			
16. PRE-EMPHASIS ☐ a. YES ☐ b. NO		17. DEVIATION RATIO	
		18. PULSE CHARACTERISTICS	
19. POWER		a. RATE	
a. MEAN		b. WIDTH	
b. PEP (U) 0.125 W - (U) 2.00 W		c. RISE TIME	
c. CARRIER		d. FALL TIME	
20. OUTPUT DEVICE (U) Integrated Circuit		e. COMP RATIO	
22. SPURIOUS LEVEL (U) -60.0 dB		21. HARMONIC LEVEL	
		a. (U) -53.0 dB	
		b. (U) -53.0 dB	
23. FCC TYPE ACCEPTANCE NO. (U) N/A		c. (U) -60.0 dB	
24. REMARKS (U) (U) Item 8. Radio has four operating bandwidth modes: 1.2 MHz, 3.6 MHz, 10 MHz, 20 MHz. All bandwidth modes utilize CPM modulation. The 10 MHz and 20 MHz modes each utilize two different CPM modulations for different types of traffic. (U) Item 12. Measured data is provided for every combination of frequency band and emission designator. The measured data shows the widest possible spectrum utilization for each emission designator. (U) Item 16. N/A			
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TRANSMITTER DATA OVERFLOW PAGE		
5. TUNING RANGE (U) 690.6000 MHz - (U) 969.4000 MHz		
7. RF CHANNELING CAPABILITY (U) 5.0000 kHz Increments		
8. EMISSION DESIGNATORS (U) 1M20G1D (U) 20M0G1D (U) 3M60G1D		
12. EMISSION BANDWIDTH		
-3.00 dB (U) 5000 kHz -20.0 dB (U) 12800 kHz -40.0 dB (U) 22400 kHz -60.0 dB (U) 30400 kHz Measured OC-BW (U) 12000 kHz	-3.00 dB (U) 600 kHz -20.0 dB (U) 1400 kHz -40.0 dB (U) 2100 kHz -60.0 dB (U) 3600 kHz Measured OC-BW (U) 1200.0 kHz	-3.00 dB (U) 600 kHz -20.0 dB (U) 1400 kHz -40.0 dB (U) 2100 kHz -60.0 dB (U) 3600 kHz Measured OC-BW (U) 1200.0 kHz
-3.00 dB (U) 600 kHz -20.0 dB (U) 1400 kHz -40.0 dB (U) 2100 kHz -60.0 dB (U) 3600 kHz Measured OC-BW (U) 1200.0 kHz	-3.00 dB (U) 9500 kHz -20.0 dB (U) 25000 kHz -40.0 dB (U) 38000 kHz -60.0 dB (U) 64000 kHz Measured OC-BW (U) 21400 kHz	-3.00 dB (U) 9500 kHz -20.0 dB (U) 25000 kHz -40.0 dB (U) 38000 kHz -60.0 dB (U) 64000 kHz Measured OC-BW (U) 21400 kHz
-3.00 dB (U) 9500 kHz -20.0 dB (U) 25000 kHz -40.0 dB (U) 38000 kHz -60.0 dB (U) 64000 kHz Measured OC-BW (U) 21400 kHz	-3.00 dB (U) 1900 kHz -20.0 dB (U) 4300 kHz -40.0 dB (U) 6300 kHz -60.0 dB (U) 9400 kHz Measured OC-BW (U) 3700.0 kHz	-3.00 dB (U) 1900 kHz -20.0 dB (U) 4300 kHz -40.0 dB (U) 6300 kHz -60.0 dB (U) 9400 kHz Measured OC-BW (U) 3700.0 kHz
-3.00 dB (U) 1900 kHz -20.0 dB (U) 4300 kHz -40.0 dB (U) 6300 kHz -60.0 dB (U) 9400 kHz Measured OC-BW (U) 3700.0 kHz		
24. REMARKS (U) Item 17. N/A (U) Item 18. N/A (U) Item 19. Radio has ALC with following selectable power levels: 0.100W, 0.250W, 0.5W, 1.0W, and 2.0W. Modulation is constant envelope. Transmitter is burst based, so transmit duty cycle (and mean transmit power) is dependent on requested data traffic. (U) Item 20. Output device is an integrated circuit power amplifier. (U) Item 21. Measured data.		
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RECEIVER EQUIPMENT CHARACTERISTICS									
1. NOMENCLATURE, MANUFACTURER'S MODEL NO. (U) TSM Radio, (U) TW-650 Core RF Module					2. MANUFACTURER'S NAME (U) TRELLISWARE TECHNOLOGIES INC.				
3. RECEIVER INSTALLATION					4. RECEIVER TYPE (U) Phase Modulation Communications				
5. TUNING RANGE (U) 225.6000 - 449.4000 MHz (See Data Overflow Page) (U) 690.6000 - 969.4000 MHz					6. METHOD OF TUNING (U) Synthesizer				
7. RF CHANNELING CAPABILITY (U) 5.0000 kHz Increments (See Data Overflow Page) (U) 5.0000 kHz Increments					8. EMISSION DESIGNATORS (U) 10M0G1D (See Data Overflow Page)				
9. FREQUENCY TOLERANCE (U) 0.5 ppm					11. RF SELECTIVITY ☐ CALCULATED ☒ MEASURED (See Data Overflow Page)				
10. IF SELECTIVITY	1st	2nd	3rd		a. -3 dB (U) 19400 kHz				
a. -3 dB					b. -20 dB (U) 22000 kHz				
b. -20 dB					c. -60 dB (U) 50000 kHz				
c. -60 dB					d. Preselection Type (U) Digitally Tunable				
12. IF FREQUENCY					13. MAXIMUM POST DETECTION FREQUENCY				
a. 1st					14. MINIMUM POST DETECTION FREQUENCY				
b. 2nd					16. MAXIMUM BIT RATE (U) 40000000 bps				
c. 3rd									
15. OSCILLATOR TUNED									
a. ABOVE TUNED FREQUENCY		1st	2nd	3rd	17. SENSITIVITY (See Data Overflow Page)				
b. BELOW TUNED FREQUENCY					a. SENSITIVITY (U) -83.5 dBm				
c. EITHER ABOVE OR BELOW THE FREQUENCY		(U) X			b. CRITERIA (U) 0.01 (U) Other				
18. DE-EMPHASIS ☐ a. YES ☐ b. NO					c. NOISE FIG (U) 8.00 dB				
19. IMAGE REJECTION					d. NOISE TEMP (U) 1540 K				
					20. SPURIOUS REJECTION (U) 80.0 dB				
21. REMARKS (U) (U) Item 10. N/A - Homodyne receiver. (U) Item 12. N/A - Homodyne receiver. (U) Item 13. N/A - CPM Modulation. (U) Item 14. N/A - CPM Modulation. (U) Item 15. N/A - Homodyne receiver.									
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RECEIVER DATA OVERFLOW PAGE			
5. TUNING RANGE (U) 1250.600 MHz - (U) 2619.400 MHz			
7. RF CHANNELING CAPABILITY (U) 5.0000 kHz Increments			
8. EMISSION DESIGNATORS (U) 1M20G1D (U) 20M0G1D (U) 3M60G1D			
11. RF SELECTIVITY			
3.00 dB(U) 8000 kHz	3.00 dB(U) 3000 kHz	3.00 dB(U) 1000 kHz	
20.0 dB(U) 10500 kHz	20.0 dB(U) 4600 kHz	20.0 dB(U) 1200 kHz	
60.0 dB(U) 34000 kHz	60.0 dB(U) 14000 kHz	60.0 dB(U) 3500 kHz	
Measured	Measured	Measured	
3.00 dB(U) 19400 kHz	3.00 dB(U) 8000 kHz	3.00 dB(U) 3000 kHz	
20.0 dB(U) 22000 kHz	20.0 dB(U) 10500 kHz	20.0 dB(U) 4600 kHz	
60.0 dB(U) 50000 kHz	60.0 dB(U) 34000 kHz	60.0 dB(U) 14000 kHz	
Measured	Measured	Measured	
3.00 dB(U) 1000 kHz	3.00 dB(U) 19400 kHz	3.00 dB(U) 8000 kHz	
20.0 dB(U) 1200 kHz	20.0 dB(U) 22000 kHz	20.0 dB(U) 10500 kHz	
60.0 dB(U) 3500 kHz	60.0 dB(U) 50000 kHz	60.0 dB(U) 34000 kHz	
Measured	Measured	Measured	
3.00 dB(U) 3000 kHz	3.00 dB(U) 1000 kHz		
20.0 dB(U) 4600 kHz	20.0 dB(U) 1200 kHz		
60.0 dB(U) 14000 kHz	60.0 dB(U) 3500 kHz		
Measured	Measured		
17. SENSITIVITY			
a. SENSITIVITY	(U) -83.5 dBm		
b. CRITERIA	(U) 0.01 (U) Other		
c. NOISE FIGURE	(U) 8.00 dB		
d. NOISE TEMPERATURE	(U) 1540 K		
a. SENSITIVITY	(U) -81.5 dBm		
b. CRITERIA	(U) 0.01 (U) Other		
c. NOISE FIGURE	(U) 8.00 dB		
d. NOISE TEMPERATURE	(U) 1540 K		
a. SENSITIVITY	(U) -101 dBm		
b. CRITERIA	(U) 0.01 (U) Other		
c. NOISE FIGURE	(U) 8.00 dB		
d. NOISE TEMPERATURE	(U) 1540 K		
a. SENSITIVITY	(U) -101 dBm		
b. CRITERIA	(U) 0.01 (U) Other		
c. NOISE FIGURE	(U) 8.00 dB		
d. NOISE TEMPERATURE	(U) 1540 K		
a. SENSITIVITY	(U) -98.0 dBm		
b. CRITERIA	(U) 0.01 (U) Other		
c. NOISE FIGURE	(U) 8.00 dB		
d. NOISE TEMPERATURE	(U) 1540 K		
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RECEIVER DATA OVERFLOW PAGE

17. SENSITIVITY (continued)

a. SENSITIVITY (U) -80.5 dBm
b. CRITERIA (U) 0.01 (U) Other
c. NOISE FIGURE (U) 8.00 dB
d. NOISE TEMPERATURE (U) 1540 K

a. SENSITIVITY (U) -80.5 dBm
b. CRITERIA (U) 0.01 (U) Other
c. NOISE FIGURE (U) 8.00 dB
d. NOISE TEMPERATURE (U) 1540 K

a. SENSITIVITY (U) -78.5 dBm
b. CRITERIA (U) 0.01 (U) Other
c. NOISE FIGURE (U) 8.00 dB
d. NOISE TEMPERATURE (U) 1540 K

a. SENSITIVITY (U) -101 dBm
b. CRITERIA (U) 0.01 (U) Other
c. NOISE FIGURE (U) 8.00 dB
d. NOISE TEMPERATURE (U) 1540 K

a. SENSITIVITY (U) -101 dBm
b. CRITERIA (U) 0.01 (U) Other
c. NOISE FIGURE (U) 8.00 dB
d. NOISE TEMPERATURE (U) 1540 K

a. SENSITIVITY (U) -98.0 dBm
b. CRITERIA (U) 0.01 (U) Other
c. NOISE FIGURE (U) 8.00 dB
d. NOISE TEMPERATURE (U) 1540 K

21. REMARKS

(U) Item 17. The 10MHz and 20MHz modes each support two different CPM modulations for different types of traffic. Sensitivity data listed here is for the higher order CPM modulation

(U) Item 17b. Packet Error Rate.

(U) Item 18. N/A - Homodyne receiver.

(U) Item 19. N/A - Homodyne receiver.

(U) Item 20. N/A - Homodyne receiver.

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ANTENNA EQUIPMENT CHARACTERISTICS			
1. ☐ a. TRANSMITTING ☐ b. RECEIVING ☐ c. TRANSMITTING AND RECEIVING			
2. NOMENCLATURE, MANUFACTURER'S MODEL NO. (U) TW-1161		3. MANUFACTURER'S NAME (U) TRELLISWARE TECHNOLOGIES INC.	
4. FREQUENCY RANGE (U) 675.0000 - 2600.000 MHz		5. TYPE (U) Halfwave Dipole	
6. POLARIZATION (U) Vertical		7. SCAN CHARACTERISTICS	
8. GAIN		a. TYPE	
a. MAIN BEAM (U) 1.00 dBi		b. VERTICAL SCAN	
b. 1st MAJOR SIDE LOBE Horz. (U) 1 dB Actual Vert. (U) 1 dB Actual		(1) Max Elev	
9. BEAMWIDTH		(2) Min Elev	
a. HORIZONTAL (U) 360 degrees		(3) Scan Rate	
b. VERTICAL (U) 80.0 degrees		c. HORIZONTAL SCAN	
		(1) Sector Scanned	
		(2) Scan Rate	
		d. SECTOR BLANKING ☐ (1) YES ☐ (2) NO	
10. REMARKS (U) (U) Item 1. Antenna is both transmit and receive. (U) Item 7. N/A - Antenna is not scanning. (U) Item 8b. N/A - Antenna does not have sidelobes. (U) Item 9b. 70-90 degrees depending on frequency.			
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ANTENNA EQUIPMENT CHARACTERISTICS			
1. ☐ a. TRANSMITTING ☐ b. RECEIVING ☐ c. TRANSMITTING AND RECEIVING			
2. NOMENCLATURE, MANUFACTURER'S MODEL NO. (U) TW-1160		3. MANUFACTURER'S NAME (U) TRELLISWARE TECHNOLOGIES INC.	
4. FREQUENCY RANGE (U) 675.0000 - 2600.000 MHz		5. TYPE (U) Halfwave Dipole	
6. POLARIZATION (U) Vertical		7. SCAN CHARACTERISTICS	
8. GAIN		a. TYPE	
a. MAIN BEAM (U) 1.00 dBi		b. VERTICAL SCAN	
b. 1st MAJOR SIDE LOBE Horz. (U) 1 dB Actual Vert. (U) 1 dB Actual		(1) Max Elev	
9. BEAMWIDTH		(2) Min Elev	
a. HORIZONTAL (U) 360 degrees		(3) Scan Rate	
b. VERTICAL (U) 80.0 degrees		c. HORIZONTAL SCAN	
		(1) Sector Scanned	
		(2) Scan Rate	
		d. SECTOR BLANKING ☐ (1) YES ☐ (2) NO	
10. REMARKS (U) (U) Item 1. Antenna is both transmit and receive. (U) Item 7. N/A - Antenna is not scanning. (U) Item 8b. N/A - Antenna does not have sidelobes. (U) Item 9b. 70-90 degrees depending on frequency.			
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ANTENNA EQUIPMENT CHARACTERISTICS			
1. ☐ a. TRANSMITTING ☐ b. RECEIVING ☐ c. TRANSMITTING AND RECEIVING			
2. NOMENCLATURE, MANUFACTURER'S MODEL NO. (U) TW-1150		3. MANUFACTURER'S NAME (U) TRELLISWARE TECHNOLOGIES INC.	
4. FREQUENCY RANGE (U) 225.0000 - 470.0000 MHz		5. TYPE (U) Halfwave Whip	
6. POLARIZATION (U) Vertical		7. SCAN CHARACTERISTICS	
8. GAIN		a. TYPE	
a. MAIN BEAM (U) 0.000 dBi		b. VERTICAL SCAN	
b. 1st MAJOR SIDE LOBE Horz. (U) 0 dB Actual Vert. (U) 0 dB Actual		(1) Max Elev	
9. BEAMWIDTH		(2) Min Elev	
a. HORIZONTAL (U) 360 degrees		(3) Scan Rate	
b. VERTICAL (U) 80.0 degrees		c. HORIZONTAL SCAN	
		(1) Sector Scanned	
		(2) Scan Rate	
		d. SECTOR BLANKING ☐ (1) YES ☐ (2) NO	
10. REMARKS (U) (U) Item 1. Antenna is both transmit and receive. (U) Item 7. N/A - Antenna is not scanning. (U) Item 8b. N/A - Antenna does not have sidelobes.			
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APPLICATION FOR SPECTRUM REVIEW	CLASSIFICATION UNCLASSIFIED	PAGE 13
NTIA GENERAL INFORMATION		
1. APPLICATION TITLE (U) TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)		
2. SYSTEM NOMENCLATURE (U) TrellisWare TSM Radios Based On The TW-650 Core RF Module (TW-650/660/661, TW-870/875, TW-900/950)		
3. STAGE OF ALLOCATION (U) ☐ a. STAGE 1 CONCEPTUAL ☐ b. STAGE 2 EXPERIMENTAL ☐ c. STAGE 3 DEVELOPMENTAL ☒ d. STAGE 4 OPERATIONAL		
4. FREQUENCY REQUIREMENTS a. FREQUENCY(IES) b. EMISSION DESIGNATORS		
5. PURPOSE OF SYSTEM, OPERATIONAL AND SYSTEM CONCEPTS (WARTIME USE) (U) ☒ a. YES ☐ b. NO (U) Provide for the mobile mesh networking dissemination of voice, video and data traffic in tactical environments.		
6. INFORMATION TRANSFER REQUIREMENTS (U) Ability to transmit voice, streaming video and IP data over multiple hops.		
7. ESTIMATED INITIAL COST OF THE SYSTEM		
8. TARGET DATE FOR		
a. APPLICATION APPROVAL (U) 6/29/2018	b. SYSTEM ACTIVATION (U) 6/29/2018	c. SYSTEM TERMINATION
9. SYSTEM RELATIONSHIP AND ESSENTIALITY (See Data Overflow Page) (U) Tactical and assault operations in harsh RF environments that can include caves/tunnels, ships, and dense urban centers. The TSM Shadow system is designed to maintain robust connectivity		
10. REPLACEMENT INFORMATION (U) NA		
11. RELATED ANALYSIS AND/OR TEST DATA		
12. NUMBER OF UNITS (U) 250		
13. GEOGRAPHICAL AREA FOR a. STAGE 2 b. STAGE 3 c. STAGE 4 (U) US&P - Polygon		
14. LINE DIAGRAM None	15. SPACE SYSTEMS	
16. TYPES OF SERVICE(S) FOR STAGE 4 Land Mobile	17. STATION CLASS(ES) FOR STAGE 4 ML	
18. REMARKS		
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NTIA DATA OVERFLOW PAGE		
9. SYSTEM RELATIONSHIP AND ESSENTIALITY Cont. (U) across all of the aforementioned RF environments providing multi-channel voice, streaming video and IP data through a mobile mesh network that requires no fixed infrastructure.		
DOWNGRADING INSTRUCTIONS Special Handling Instruction : P		CLASSIFICATION UNCLASSIFIED

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5. (U) TSM Radio
- 1494 Receiver Pages
7. (U) TSM Radio
- 1494 Antenna Pages
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11. (U) TW-1160
12. (U) TW-1150
13. (U) NTIA Page