

# UNCLASSIFIED

## SECURITY SUMMARY & SPECIAL HANDLING REQUIREMENTS

It is your responsibility to ensure that each page of this application is marked in accordance with the procedures in your security manual. The following summaries are provided for that purpose.

APPLICATION TITLE: (U) Fortress Technologies ES2440-3444

OVERALL CLASSIFICATION: UNCLASSIFIED

SPECIAL HANDLING:

DERIVATIVE CLASSIFICATION(S):

ORIGINAL CLASSIFICATION AUTHORITY:

REASON(S) FOR CLASSIFICATION:

DECLASSIFICATION INSTRUCTIONS:

DECLASSIFICATION DATE:

DECLASSIFICATION EVENT:

DOWNGRADING CLASSIFICATION:

DOWNGRADING DATE:

| SECTION                                  | STARTING<br>PAGE # | CLASSIFICATION |
|------------------------------------------|--------------------|----------------|
| DOD GENERAL INFORMATION                  | 1                  | UNCLASSIFIED   |
| TRANSMITTER EQUIPMENT CHARACTERISTICS #1 | 3                  | UNCLASSIFIED   |
| TRANSMITTER EQUIPMENT CHARACTERISTICS #2 | 7                  | UNCLASSIFIED   |
| TRANSMITTER EQUIPMENT CHARACTERISTICS #3 | 9                  | UNCLASSIFIED   |
| TRANSMITTER EQUIPMENT CHARACTERISTICS #4 | 11                 | UNCLASSIFIED   |
| RECEIVER EQUIPMENT CHARACTERISTICS #1    | 13                 | UNCLASSIFIED   |
| RECEIVER EQUIPMENT CHARACTERISTICS #2    | 15                 | UNCLASSIFIED   |
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UNCLASSIFIED

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                                                                                   |                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------|
| APPLICATION FOR EQUIPMENT<br>FREQUENCY ALLOCATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CLASSIFICATION<br><b>UNCLASSIFIED</b> | DATE                                                                                              | J/F 12/                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                                                                                   | Page 1 of 21                          |
| DOD GENERAL INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |                                                                                                   |                                       |
| TO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       | FROM                                                                                              |                                       |
| 1. APPLICATION TITLE (U)<br>Fortress Technologies ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |                                                                                                   |                                       |
| 2. SYSTEM NOMENCLATURE (U)<br>Fortress Technologies ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                                                                                   |                                       |
| 3. STAGE OF ALLOCATION (U) <input type="checkbox"/> a. STAGE 1 CONCEPTUAL <input type="checkbox"/> b. STAGE 2 EXPERIMENTAL <input type="checkbox"/> c. STAGE 3 DEVELOPMENTAL <input checked="" type="checkbox"/> d. STAGE 4 OPERATIONAL                                                                                                                                                                                                                                                                                                                    |                                       |                                                                                                   |                                       |
| 4. FREQUENCY REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |                                                                                                   |                                       |
| a. FREQUENCY(IES) (U)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       | b. EMISSION DESIGNATORS (U)                                                                       |                                       |
| 2.412 GHz - 2.462 GHz<br>5.180 GHz - 5.320 GHz<br>5.500 GHz - 5.580 GHz<br>5.660 GHz - 5.700 GHz<br>5.745 GHz - 5.825 GHz<br>4.950 GHz - 4.980 GHz<br>4.410 GHz - 4.810 GHz                                                                                                                                                                                                                                                                                                                                                                                |                                       | 22M0G1D<br>33M1D1D<br><br>16M5D1D                                                                 |                                       |
| 5. TARGET STARTING DATE FOR SUBSEQUENT STAGES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |                                                                                                   |                                       |
| a. STAGE 2 (U) NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       | b. STAGE 3 (U) NA                      c. STAGE 4 (U) NA                                          |                                       |
| 6. EXTENT OF USE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                       |                                                                                                   |                                       |
| 7. GEOGRAPHICAL AREA FOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                                                                                                   |                                       |
| a. STAGE 2 (U) NA<br>b. STAGE 3 (U) NA<br>c. STAGE 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       |                                                                                                   |                                       |
| 8. NUMBER OF UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                                                                                   |                                       |
| a. STAGE 2 (U) NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       | b. STAGE 3 (U) NA                      c. STAGE 4                                                 |                                       |
| 9. NUMBER OF UNITS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                                                                                                   |                                       |
| 10. OTHER J/F 12 APPLICATION ID(S) TO BE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       | 11. IS THERE ANY OPERATIONAL REQUIREMENT AS DESCRIBED IN THE INSTRUCTIONS FOR PARAGRAPH 11?       |                                       |
| a. SUPERSEDED<br><br>b. RELATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       | <input type="checkbox"/> a. YES <input type="checkbox"/> b. NO <input type="checkbox"/> c. NAVAIL |                                       |
| 12. NAMES AND TELEPHONE NUMBERS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                                                                                   |                                       |
| a. PROGRAM MANAGER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       | b. PROJECT ENGINEER                                                                               |                                       |
| NAME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       | NAME                                                                                              |                                       |
| COMMERCIAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                       | COMMERCIAL                                                                                        |                                       |
| DSN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       | DSN                                                                                               |                                       |
| EMAIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       | EMAIL                                                                                             |                                       |
| 13. REMARKS<br>(U) DOD General Information Remarks:<br>The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to- |                                       |                                                                                                   |                                       |
| DOWNGRADING INSTRUCTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                                                                                                   | J/F 12/                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                                                                                   | CLASSIFICATION<br><b>UNCLASSIFIED</b> |

## DOD GENERAL INFORMATION

point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

**TRANSMITTER EQUIPMENT CHARACTERISTICS****1. NOMENCLATURE, MANUFACTURER'S MODEL NO.**

(U) ES2440-3444

**2. MANUFACTURER'S NAME**

(U) Fortress Technologies

**3. TRANSMITTER INSTALLATION (U)**

Internal ITE equipment or external pole mount

**4. TRANSMITTER TYPE**

(U) OFDM/DSS transmitter with adaptive modulation (802.11a/b/g/n)

**5. TUNING RANGE (U)**2.412 GHz - 2.462 GHz  
5.180 GHz - 5.320 GHz  
5.500 GHz - 5.580 GHz  
5.660 GHz - 5.700 GHz  
5.745 GHz - 5.825 GHz  
4.950 GHz - 4.980 GHz  
4.410 GHz - 4.810 GHz**6. METHOD OF TUNING**

(U) RF channeling capability is SW controlled \*(See Remarks) \*(See Remarks)

**7. RF CHANNELING CAPABILITY (U)** 2.412 GHz, 5 MHz increments, 11 channels, standard 802.11b/g/n 5.180 GHz, 20 MHz increments, 8 channels; standard 802.11a/n 5.500 GHz, 20 MHz increments, 5 channels; standard 802.11a/n 5.660 GHz, 20 M \*(See Remarks)**8. EMISSION DESIGNATOR (U) 22M0G1D****12. EMISSION BANDWIDTH (U)****a. -3 dB****b. -20 dB****c. -40 dB****d. -60 dB****e. OC-BW**☐ Calculated ☒ Measured

9.72 MHz

17.68 MHz

31.13 MHz

42.15 MHz

22.23 MHz

**13. MAXIMUM BIT RATE (U)**

11 Mbps

**14. MODULATION TECHNIQUES AND CODING (U)**

Modulation, coding &amp; associated data rates as per emission designator:

22M0G1D

(802.11b, 802.11g, 20 MHz)

DBPSK-1Mbps, DQPSK-2Mbps, CCK-5.5Mbps, CCK-11Mbps

**15. MAXIMUM MODULATION FREQUENCY (U) NA****17. DEVIATION RATIO (U) NA****18. PULSE CHARACTERISTICS****a. RATE****b. WIDTH****c. RISE TIME****d. FALL TIME****e. COMP RATIO**

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

**19. POWER****a. MEAN (U)** 171.4 mW**b. PEP (U)** 375.84 mW

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 8. EMISSION DESIGNATOR (U) 16M5D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dBb. -20 dBc. -40 dBd. -60 dBe. OC-BW

Calculated



Measured

15.875 MHz

19.44 MHz

43.54 MHz

63.67 MHz

16.79 MHz

## 13. MAXIMUM BIT RATE (U)

130 Mbps

14. MODULATION TECHNIQUES  
AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

SISO

16M5D1D

(802.11a, 802.11g, 20 MHz)

BPSK-1/2-6Mbps, BPSK-3/4-9Mbps, QPSK-1/2-12Mbps, QPSK-3/4-18Mbps,

16QAM-1/2-24Mbps, 16QAM-3/4-36Mbps, 64QAM-1/2-48Mbps, 64QAM-3/4-54Mbps)

(802.11n, 800ns GI, 1 x 1 SISO, 20 MHz):

BPSK-1/2-6.5Mbps, QPSK-1/2-13Mbps, QPSK-3/4-19.5Mbps, 16QAM-1/2-26Mbps,

16QAM-3/4-39Mbps, 64QAM-2/3-52Mbps, 64QAM-3/4-58.5Mbps, 64QAM-5/6-65Mbps

MIMO

(802.11n, 800ns GI, 2 x 2 MIMO, 20 MHz):

BPSK-1/2-13Mbps, QPSK-1/2-26Mbps, QPSK-3/4-39Mbps, 16QAM-1/2-52Mbps,

16QAM-3/4-78Mbps, 64QAM-2/3-104Mbps, 64QAM-3/4-117Mbps, 64QAM-5/6-130Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATEb. WIDTHc. RISE TIMEd. FALL TIMEe. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

**a. MEAN** (U) 122.18 mW**b. PEP** (U) 386.37 mW

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 8. EMISSION DESIGNATOR (U) 33M1D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dBb. -20 dBc. -40 dBd. -60 dBe. OC-BW☐ Calculated ☒ Measured

33.92 MHz

38 MHz

91.94 MHz

137.40 MHz

35.97 MHz

## 13. MAXIMUM BIT RATE (U)

300 Mbps

14. MODULATION TECHNIQUES  
AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

SISO

33M1D1D

(802.11n, 800ns GI, 1 x 1 SISO, 40 MHz)

BPSK-1/2-13.5Mbps, QPSK-1/2-27Mbps, QPSK-3/4-40.5Mbps, 16QAM-1/2-54Mbps,  
16QAM-3/4-81Mbps, 64QAM-2/3-108Mbps, 64QAM-3/4-121.5Mbps, 64QAM-5/6-135Mbps  
(802.11n, 400ns GI, 1 x 1 SISO, 40 MHz):BPSK-1/2-15Mbps, QPSK-1/2-30Mbps, QPSK-3/4-45Mbps, 16QAM-1/2-60Mbps,  
16QAM-3/4-90Mbps, 64QAM-2/3-120Mbps, 64QAM-3/4-135Mbps, 64QAM-5/6-150Mbps

MIMO

(802.11n, 800ns GI, 2 x 2 MIMO, 40 MHz):

BPSK-1/2-27Mbps, QPSK-1/2-54Mbps, QPSK-3/4-81Mbps, 16QAM-1/2-108Mbps,  
16QAM-3/4-162Mbps, 64QAM-2/3-216Mbps, 64QAM-3/4-243Mbps, 64QAM-5/6-270Mbps

(802.11n, 400ns GI, 2 x 2 MIMO, 40 MHz):

BPSK-1/2-30Mbps, QPSK-1/2-60Mbps, QPSK-3/4-90Mbps, 16QAM-1/2-120Mbps,  
16QAM-3/4-180Mbps, 64QAM-2/3-240Mbps, 64QAM-3/4-270Mbps, 64QAM-5/6-300Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATEb. WIDTHc. RISE TIMEd. FALL TIMEe. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

a. MEAN (U) 121.9 mWb. PEP (U) 369.83 mW

## 9. FREQUENCY TOLERANCE (U) 25 ppm

## 10. FILTER EMPLOYED

(U) ☒ a. YES ☐ b. NO

## 11. SPREAD SPECTRUM

(U) ☒ a. YES ☐ b. NO

## 16. PRE-EMPHASIS

(U) ☐ a. YES ☒ b. NO

## 20. OUTPUT DEVICE

(U) Power Amplifier (low power SiGe transistor)

## 22. SPURIOUS LEVEL

(U) -54 dB

## 21. HARMONIC LEVEL

a. 2nd (U) -30 dBb. 3rd (U) -50 dBc. OTHER (U) -75 dB

## 23. FCC TYPE ACCEPTANCE NO.

(U) NA

## 24. REMARKS

(U) Item 6:

The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified."

(U) Item 7:

2.412 GHz, 5 MHz increments, 11 channels, standard 802.11b/g/n

5.180 GHz, 20 MHz increments, 8 channels; standard 802.11a/n

5.500 GHz, 20 MHz increments, 5 channels; standard 802.11a/n

5.660 GHz, 20 MHz increments, 3 channels; standard 802.11a/n

5.745 GHz, 20 MHz increments, 5 channels; standard 802.11a/n

4.950 GHz, 20 MHz increments, 4 channels; standard 802.11a

## TRANSMITTER EQUIPMENT CHARACTERISTICS

(U) Transmitter Remarks:

The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

**TRANSMITTER EQUIPMENT CHARACTERISTICS****1. NOMENCLATURE, MANUFACTURER'S MODEL NO.**

(U) ES2440-3444

**2. MANUFACTURER'S NAME**

(U) Fortress Technologies

**3. TRANSMITTER INSTALLATION (U)**

Internal ITE equipment or external pole mount

**4. TRANSMITTER TYPE**

(U) OFDM with adaptive modulation (802.11a/n) over 4.4 GHz band

**5. TUNING RANGE (U)**

4.410 GHz - 4.810 GHz

**6. METHOD OF TUNING**

(U) RF channeling capability is SW controlled \*(See Remarks) \*(See Remarks)

**7. RF CHANNELING CAPABILITY (U)** 4.410 GHz, 20 MHz increments, 21 channels; \*(See Remarks)**8. EMISSION DESIGNATOR (U)** 16M5D1D**12. EMISSION BANDWIDTH (U)**☐ Calculated ☒ Measured**a. -3 dB**

16.31 MHz

**b. -20 dB**

20.27 MHz

**c. -40 dB**

37.23 MHz

**d. -60 dB**

63.67 MHz

**e. OC-BW**

16.64 MHz

**13. MAXIMUM BIT RATE (U)**

65 Mbps

**14. MODULATION TECHNIQUES AND CODING (U)**

Modulation, coding &amp; associated data rates as per emission designator:

16M5D1D

(802.11a, 20 MHz):

BPSK-1/2-6Mbps, BPSK-3/4-9Mbps, QPSK-1/2-12Mbps, QPSK-3/4-18Mbps,

16QAM-1/2-24Mbps, 16QAM-3/4-36Mbps, 64QAM-1/2-48Mbps, 64QAM-3/4-54Mbps)

(802.11n, 800ns GI, 1 x 1 SISO, 20 MHz):

BPSK-1/2-6.5Mbps, QPSK-1/2-13Mbps, QPSK-3/4-19.5Mbps, 16QAM-1/2-26Mbps,

16QAM-3/4-39Mbps, 64QAM-2/3-52Mbps, 64QAM-3/4-58.5Mbps, 64QAM-5/6-65Mbps

**15. MAXIMUM MODULATION FREQUENCY (U)** NA**17. DEVIATION RATIO (U)** NA**18. PULSE CHARACTERISTICS****a. RATE**

(U)

NA

**b. WIDTH**

(U)

NA

**c. RISE TIME**

(U)

NA

**d. FALL TIME**

(U)

NA

**e. COMP RATIO**

(U)

NA

**19. POWER****a. MEAN (U)** 100.69 mW**b. PEP (U)** 257.63 mW

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 8. EMISSION DESIGNATOR (U) 33M1D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dB

b. -20 dB

c. -40 dB

d. -60 dB

e. OC-BW

☐ Calculated ☒ Measured

35.57 MHz

38.67 MHz

96.51 MHz

137.40 MHz

36.09 MHz

## 13. MAXIMUM BIT RATE (U)

135 Mbps

## 14. MODULATION TECHNIQUES AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

33M1D1D

(802.11n, 800ns GI, 1 x 1 SISO, 40 MHz):

BPSK-1/2-13.5Mbps, QPSK-1/2-27Mbps, QPSK-3/4-40.5Mbps, 16QAM-1/2-54Mbps, 16QAM-3/4-81Mbps, 64QAM-2/3-108Mbps, 64QAM-3/4-121.5Mbps, 64QAM-5/6-135Mbps

(802.11n, 400ns GI, 1 x 1 SISO, 40 MHz):

BPSK-1/2-15Mbps, QPSK-1/2-30Mbps, QPSK-3/4-45Mbps, 16QAM-1/2-60Mbps, 16QAM-3/4-90Mbps, 64QAM-2/3-120Mbps, 64QAM-3/4-135Mbps, 64QAM-5/6-150Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATE

b. WIDTH

c. RISE TIME

d. FALL TIME

e. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

a. MEAN (U) 126.18 mW

b. PEP (U) 309.03 mW

## 9. FREQUENCY TOLERANCE (U) 10 ppm

## 10. FILTER EMPLOYED

(U) ☒ a. YES ☐ b. NO

## 11. SPREAD SPECTRUM

(U) ☐ a. YES ☒ b. NO

## 16. PRE-EMPHASIS

(U) ☐ a. YES ☒ b. NO

## 20. OUTPUT DEVICE

(U) Power Amplifier (low power SiGe transistor)

## 22. SPURIOUS LEVEL

(U) -54 dB

## 21. HARMONIC LEVEL

a. 2nd (U) -30 dB

b. 3rd (U) -50 dB

c. OTHER (U) -75 dB

## 23. FCC TYPE ACCEPTANCE NO.

(U) NA

## 24. REMARKS

(U) Item 6:

The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified."

(U) Item 7:

4.410 GHz, 20 MHz increments, 21 channels, standard 802.11a over 4.4GHz frequencies

(U) Transmitter Remarks:

The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 1. NOMENCLATURE, MANUFACTURER'S MODEL NO.

(U) ES2440-3444

## 2. MANUFACTURER'S NAME

(U) Fortress Technologies

## 3. TRANSMITTER INSTALLATION (U)

Internal ITE equipment or external pole mount

## 4. TRANSMITTER TYPE

(U) OFDM with adaptive modulation (802.11a/n) over 4.4 GHz band

## 5. TUNING RANGE (U)

4.410 GHz - 4.810 GHz

## 6. METHOD OF TUNING

(U) RF channeling capability is SW controlled \*(See Remarks) \*(See Remarks)

7. RF CHANNELING CAPABILITY (U) 4.410 GHz, 20 MHz increments, 21 channels; \*(See Remarks)

## 8. EMISSION DESIGNATOR (U) 16M5D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dBb. -20 dBc. -40 dBd. -60 dBe. OC-BW

Calculated



Measured

16.31 MHz

20.27 MHz

37.23 MHz

63.67 MHz

16.64 MHz

## 13. MAXIMUM BIT RATE (U)

65 Mbps

## 14. MODULATION TECHNIQUES AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

16M5D1D

(802.11a, 20 MHz):

BPSK-1/2-6Mbps, BPSK-3/4-9Mbps, QPSK-1/2-12Mbps, QPSK-3/4-18Mbps,

16QAM-1/2-24Mbps, 16QAM-3/4-36Mbps, 64QAM-1/2-48Mbps, 64QAM-3/4-54Mbps)

(802.11n, 800ns GI, 1 x 1 SISO, 20 MHz):

BPSK-1/2-6.5Mbps, QPSK-1/2-13Mbps, QPSK-3/4-19.5Mbps, 16QAM-1/2-26Mbps,

16QAM-3/4-39Mbps, 64QAM-2/3-52Mbps, 64QAM-3/4-58.5Mbps, 64QAM-5/6-65Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATEb. WIDTHc. RISE TIMEd. FALL TIMEe. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

a. MEAN (U) 100.69 mW

b. PEP (U) 257.63 mW

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 8. EMISSION DESIGNATOR (U) 33M1D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dB

b. -20 dB

c. -40 dB

d. -60 dB

e. OC-BW

☐

Calculated

☒

Measured

35.57 MHz

38.67 MHz

96.51 MHz

137.40 MHz

36.09 MHz

## 13. MAXIMUM BIT RATE (U)

135 Mbps

## 14. MODULATION TECHNIQUES AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

33M1D1D

(802.11n, 800ns GI, 1 x 1 SISO, 40 MHz):

BPSK-1/2-13.5Mbps, QPSK-1/2-27Mbps, QPSK-3/4-40.5Mbps, 16QAM-1/2-54Mbps, 16QAM-3/4-81Mbps, 64QAM-2/3-108Mbps, 64QAM-3/4-121.5Mbps, 64QAM-5/6-135Mbps

(802.11n, 400ns GI, 1 x 1 SISO, 40 MHz):

BPSK-1/2-15Mbps, QPSK-1/2-30Mbps, QPSK-3/4-45Mbps, 16QAM-1/2-60Mbps, 16QAM-3/4-90Mbps, 64QAM-2/3-120Mbps, 64QAM-3/4-135Mbps, 64QAM-5/6-150Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATE

b. WIDTH

c. RISE TIME

d. FALL TIME

e. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

a. MEAN (U) 126.18 mW

b. PEP (U) 309.03 mW

## 9. FREQUENCY TOLERANCE (U) 10 ppm

## 10. FILTER EMPLOYED

(U) ☒ a. YES ☐ b. NO

## 11. SPREAD SPECTRUM

(U) ☐ a. YES ☒ b. NO

## 16. PRE-EMPHASIS

(U) ☐ a. YES ☒ b. NO

## 20. OUTPUT DEVICE

(U) Power Amplifier (low power SiGe transistor)

## 22. SPURIOUS LEVEL

(U) -54 dB

## 21. HARMONIC LEVEL

a. 2nd (U) -30 dB

b. 3rd (U) -50 dB

c. OTHER (U) -75 dB

## 23. FCC TYPE ACCEPTANCE NO.

(U) NA

## 24. REMARKS

(U) Item 6:

The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified."

(U) Item 7:

4.410 GHz, 20 MHz increments, 21 channels, standard 802.11a over 4.4GHz frequencies

(U) Transmitter Remarks:

The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 1. NOMENCLATURE, MANUFACTURER'S MODEL NO.

(U) ES2440-3444

## 2. MANUFACTURER'S NAME

(U) Fortress Technologies

## 3. TRANSMITTER INSTALLATION (U)

Internal ITE equipment or external pole mount

## 4. TRANSMITTER TYPE

(U) OFDM with adaptive modulation (802.11a/n) over 4.4 GHz band

## 5. TUNING RANGE (U)

4.410 GHz - 4.810 GHz

## 6. METHOD OF TUNING

(U) RF channeling capability is SW controlled \*(See Remarks) \*(See Remarks)

7. RF CHANNELING CAPABILITY (U) 4.410 GHz, 20 MHz increments, 21 channels; \*(See Remarks)

## 8. EMISSION DESIGNATOR (U) 16M5D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dBb. -20 dBc. -40 dBd. -60 dBe. OC-BW

Calculated



Measured

16.31 MHz

20.27 MHz

37.23 MHz

63.67 MHz

16.64 MHz

## 13. MAXIMUM BIT RATE (U)

65 Mbps

## 14. MODULATION TECHNIQUES AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

16M5D1D

(802.11a, 20 MHz):

BPSK-1/2-6Mbps, BPSK-3/4-9Mbps, QPSK-1/2-12Mbps, QPSK-3/4-18Mbps,

16QAM-1/2-24Mbps, 16QAM-3/4-36Mbps, 64QAM-1/2-48Mbps, 64QAM-3/4-54Mbps)

(802.11n, 800ns GI, 1 x 1 SISO, 20 MHz):

BPSK-1/2-6.5Mbps, QPSK-1/2-13Mbps, QPSK-3/4-19.5Mbps, 16QAM-1/2-26Mbps,

16QAM-3/4-39Mbps, 64QAM-2/3-52Mbps, 64QAM-3/4-58.5Mbps, 64QAM-5/6-65Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATEb. WIDTHc. RISE TIMEd. FALL TIMEe. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

a. MEAN (U) 100.69 mW

b. PEP (U) 257.63 mW

## TRANSMITTER EQUIPMENT CHARACTERISTICS

## 8. EMISSION DESIGNATOR (U) 33M1D1D

## 12. EMISSION BANDWIDTH (U)

a. -3 dB

b. -20 dB

c. -40 dB

d. -60 dB

e. OC-BW

☐ Calculated ☒ Measured

35.57 MHz

38.67 MHz

96.51 MHz

137.40 MHz

36.09 MHz

## 13. MAXIMUM BIT RATE (U)

135 Mbps

## 14. MODULATION TECHNIQUES AND CODING (U)

Modulation, coding &amp; associated data rates as per emission designator:

33M1D1D

(802.11n, 800ns GI, 1 x 1 SISO, 40 MHz):

BPSK-1/2-13.5Mbps, QPSK-1/2-27Mbps, QPSK-3/4-40.5Mbps, 16QAM-1/2-54Mbps, 16QAM-3/4-81Mbps, 64QAM-2/3-108Mbps, 64QAM-3/4-121.5Mbps, 64QAM-5/6-135Mbps

(802.11n, 400ns GI, 1 x 1 SISO, 40 MHz):

BPSK-1/2-15Mbps, QPSK-1/2-30Mbps, QPSK-3/4-45Mbps, 16QAM-1/2-60Mbps, 16QAM-3/4-90Mbps, 64QAM-2/3-120Mbps, 64QAM-3/4-135Mbps, 64QAM-5/6-150Mbps

## 15. MAXIMUM MODULATION FREQUENCY (U) NA

## 17. DEVIATION RATIO (U) NA

## 18. PULSE CHARACTERISTICS

a. RATE

b. WIDTH

c. RISE TIME

d. FALL TIME

e. COMP RATIO

(U)

(U)

(U)

(U)

(U)

NA

NA

NA

NA

NA

## 19. POWER

a. MEAN (U) 126.18 mW

b. PEP (U) 309.03 mW

## 9. FREQUENCY TOLERANCE (U) 10 ppm

## 10. FILTER EMPLOYED

(U) ☒ a. YES ☐ b. NO

## 11. SPREAD SPECTRUM

(U) ☐ a. YES ☒ b. NO

## 16. PRE-EMPHASIS

(U) ☐ a. YES ☒ b. NO

## 20. OUTPUT DEVICE

(U) Power Amplifier (low power SiGe transistor)

## 22. SPURIOUS LEVEL

(U) -54 dB

## 21. HARMONIC LEVEL

a. 2nd (U) -30 dB

b. 3rd (U) -50 dB

c. OTHER (U) -75 dB

## 23. FCC TYPE ACCEPTANCE NO.

(U) NA

## 24. REMARKS

(U) Item 6:

The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified."

(U) Item 7:

4.410 GHz, 20 MHz increments, 21 channels, standard 802.11a over 4.4GHz frequencies

(U) Transmitter Remarks:

The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |                                                                                                                                                          |                                           |  |
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| <b>CLASSIFICATION</b> <b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |                                                                                                                                                          | <b>Page 13 of 21</b>                      |  |
| <b>RECEIVER EQUIPMENT CHARACTERISTICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |                                                                                                                                                          |                                           |  |
| <b>1. NOMENCLATURE, MANUFACTURER'S MODEL NO.</b><br>(U)    ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                | <b>2. MANUFACTURER'S NAME</b><br>(U)    Fortress Technologies                                                                                            |                                           |  |
| <b>3. RECEIVER INSTALLATION (U)</b><br>Internal ITE equipment or external pole mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                | <b>4. RECEIVER TYPE</b><br>(U)    OFDM/DSS (802.11a/b/g/n)                                                                                               |                                           |  |
| <b>5. TUNING RANGE (U)</b><br><br>2.412 GHz - 2.462 GHz<br>5.180 GHz - 5.320 GHz<br>5.500 GHz - 5.580 GHz<br>5.660 GHz - 5.700 GHz<br>5.745 GHz - 5.825 GHz<br>4.950 GHz - 4.980 GHz<br>4.410 GHz - 4.810 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                | <b>6. METHOD OF TUNING</b><br><br>(U)    RF channeling capability is SW controlled<br>*(See Remarks)                                                     |                                           |  |
| <b>7. RF CHANNELING CAPABILITY</b><br>(U)    2.412 GHz, 5 MHz increments, 11 channels, standard 802.11b/g/n 5.180 GHz, 20 MHz increments, 8 channels; standard 802.11a/n 5.500 GHz, 20 MHz increments, 5 channels; standard 802.11a/n 5.660 GHz, 20 M    *(See Remarks)                                                                                                                                                                                                                                                                                                                                                                              |                |                | <b>8. EMISSION DESIGNATORS (U)</b><br><br>22M0G1D16M5D1D33M1D1D                                                                                          |                                           |  |
| <b>9. FREQUENCY TOLERANCE</b><br>(U) 25 ppm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                | <b>11. RF SELECTIVITY</b><br><input type="checkbox"/> Calculated <input checked="" type="checkbox"/> Measured                                            |                                           |  |
| <b>10. IF SELECTIVITY</b><br>*(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>1st (U)</b> | <b>2nd (U)</b> | <b>a. -3 dB (U)</b> 15 MHz<br><b>b. -20 dB (U)</b> 20 MHz<br><b>c. -60 dB (U)</b> 30 MHz<br><b>d. Preselection Type (U)</b> OFDM and adaptive modulation |                                           |  |
| <b>a. -3 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NA             | NA             |                                                                                                                                                          |                                           |  |
| <b>b. -20 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | NA             | NA             |                                                                                                                                                          |                                           |  |
| <b>c. -60 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | NA             | NA             |                                                                                                                                                          |                                           |  |
| <b>12. IF FREQUENCY</b> *(See Remarks)<br><b>a. 1st (U)</b> NA<br><br><b>b. 2nd (U)</b> NA<br><br><b>c. 3rd (U)</b> NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                | <b>13. MAXIMUM POST DETECTION FREQUENCY (U)</b><br>NA                                                                                                    |                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                | <b>14. MINIMUM POST DETECTION FREQUENCY (U)</b><br><br>NA                                                                                                |                                           |  |
| <b>15. OSCILLATOR TUNED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>1st (U)</b> | <b>2nd (U)</b> | <b>3rd (U)</b>                                                                                                                                           | <b>17. SENSITIVITY</b>                    |  |
| <b>a. ABOVE TUNED FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NA             | NA             | NA                                                                                                                                                       | <b>a. SENSITIVITY (U)</b> -94 dBm         |  |
| <b>b. BELOW TUNED FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NA             | NA             | NA                                                                                                                                                       | <b>b. CRITERIA (U)</b> Manufacturing Spec |  |
| <b>c. EITHER ABOVE OR BELOW THE FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | NA             | NA             | NA                                                                                                                                                       | <b>c. NOISE FIG (U)</b> 3 dB              |  |
| <b>16. MAXIMUM BIT RATE (U)</b> 135 Mbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                | <b>d. NOISE TEMP (U)</b> NA                                                                                                                              |                                           |  |
| <b>18. DE-EMPHASIS (U)</b><br><br><input type="checkbox"/> a. YES <input checked="" type="checkbox"/> b. NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                | <b>19. IMAGE REJECTION (U)</b> NA                                                                                                                        |                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                | <b>20. SPURIOUS REJECTION (U)</b> NA                                                                                                                     |                                           |  |
| <b>21. REMARKS</b><br><div style="margin-left: 40px;">         (U) Item 6:<br/>         The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified.       </div> <div style="margin-left: 40px; margin-top: 10px;">         (U) Item 7:<br/>         2.412 GHz, 5 MHz increments, 11 channels, standard 802.11b/g/n<br/>         5.180 GHz, 20 MHz increments, 8 channels; standard 802.11a/n<br/>         5.500 GHz, 20 MHz increments, 5 channels; standard 802.11a/n<br/>         5.660 GHz, 20 MHz increments, 3 channels; standard 802.11a/n       </div> |                |                |                                                                                                                                                          |                                           |  |
| <b>CLASSIFICATION</b> <b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                |                                                                                                                                                          | <b>J/F 12/</b>                            |  |

## RECEIVER EQUIPMENT CHARACTERISTICS

5.745 GHz, 20 MHz increments, 5 channels; standard 802.11a/n  
4.950 GHz, 20 MHz increments, 4 channels; standard 802.11a

(U) Item 10:  
Zero IF Infrastructure

(U) Item 12:  
Zero IF Infrastructure

(U) Receiver Remarks:  
The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |                                                                                                                             |                          |                                                                                                                                                                 |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <div> <div>CLASSIFICATION</div> <div>UNCLASSIFIED</div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |          |                                                                                                                             | <div>Page 15 of 21</div> |                                                                                                                                                                 |  |
| <div>RECEIVER EQUIPMENT CHARACTERISTICS</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |          |                                                                                                                             |                          |                                                                                                                                                                 |  |
| <div>1. NOMENCLATURE, MANUFACTURER'S MODEL NO.</div> <div>(U) ES2440-3444</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          | <div>2. MANUFACTURER'S NAME</div> <div>(U) Fortress Technologies</div>                                                      |                          |                                                                                                                                                                 |  |
| <div>3. RECEIVER INSTALLATION (U)</div> <div>Internal ITE equipment or external pole mount</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |          | <div>4. RECEIVER TYPE</div> <div>(U) Wi-Fi 802.11a/n receiver in 4.4 GHz range</div>                                        |                          |                                                                                                                                                                 |  |
| <div>5. TUNING RANGE (U)</div> <div>4.410 GHz - 4.810 GHz</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          | <div>6. METHOD OF TUNING</div> <div>(U) RF channeling capability is SW controlled<br/>*(See Remarks)</div>                  |                          |                                                                                                                                                                 |  |
| <div>7. RF CHANNELING CAPABILITY</div> <div>(U) 4.410 GHz, 20 MHz increments, 21 channels;<br/>*(See Remarks)</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |          | <div>8. EMISSION DESIGNATORS (U)</div> <div>16M5D1D 33M1D1D</div>                                                           |                          |                                                                                                                                                                 |  |
| <div>9. FREQUENCY TOLERANCE</div> <div>(U) 10 ppm</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |          | <div>11. RF SELECTIVITY</div> <div> <input type="checkbox"/> Calculated <input checked="" type="checkbox"/> Measured </div> |                          |                                                                                                                                                                 |  |
| <div>10. IF SELECTIVITY</div> <div>*(See Remarks)</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  | 1st (U)  | 2nd (U)                                                                                                                     | 3rd (U)                  | <div>a. -3 dB (U) 15 MHz</div> <div>b. -20 dB (U) 20 MHz</div> <div>c. -60 dB (U) 30 MHz</div> <div>d. Preselection Type (U) OFDM and adaptive modulation</div> |  |
| a. -3 dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | 700 MHz  | NA                                                                                                                          | NA                       |                                                                                                                                                                 |  |
| b. -20 dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  | 1200 MHz | NA                                                                                                                          | NA                       |                                                                                                                                                                 |  |
| c. -60 dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  | 4000 MHz | NA                                                                                                                          | NA                       |                                                                                                                                                                 |  |
| <div>12. IF FREQUENCY</div> <div>*(See Remarks)</div> <div>a. 1st (U) NA</div> <div>b. 2nd (U) NA</div> <div>c. 3rd (U) NA</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |          | <div>13. MAXIMUM POST DETECTION FREQUENCY (U)</div> <div>NA</div>                                                           |                          |                                                                                                                                                                 |  |
| <div>14. MINIMUM POST DETECTION FREQUENCY (U)</div> <div>NA</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |          |                                                                                                                             |                          |                                                                                                                                                                 |  |
| <div>15. OSCILLATOR TUNED</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  | 1st (U)  | 2nd (U)                                                                                                                     | 3rd (U)                  | <div>17. SENSITIVITY</div>                                                                                                                                      |  |
| a. ABOVE TUNED FREQUENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | NA       | NA                                                                                                                          | NA                       | a. SENSITIVITY (U) -94 dBm                                                                                                                                      |  |
| b. BELOW TUNED FREQUENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | NA       | NA                                                                                                                          | NA                       | b. CRITERIA (U) Manufacturing Spec                                                                                                                              |  |
| c. EITHER ABOVE OR BELOW THE FREQUENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  | NA       | NA                                                                                                                          | NA                       | c. NOISE FIG (U) 3 dB                                                                                                                                           |  |
| <div>16. MAXIMUM BIT RATE (U)</div> <div>135 Mbps</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |          | <div>d. NOISE TEMP (U) NA</div>                                                                                             |                          |                                                                                                                                                                 |  |
| <div>18. DE-EMPHASIS (U)</div> <div> <input type="checkbox"/> a. YES <input checked="" type="checkbox"/> b. NO </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |          | <div>19. IMAGE REJECTION (U) NA</div>                                                                                       |                          |                                                                                                                                                                 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          | <div>20. SPURIOUS REJECTION (U) NA</div>                                                                                    |                          |                                                                                                                                                                 |  |
| <div>21. REMARKS</div> <div> <div>(U) Item 6:</div> <div>The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified.</div> <div>(U) Item 7:</div> <div>4.410 GHz, 20 MHz increments, 21 channels, standard 802.11a over 4.4GHz frequencies</div> <div>(U) Item 10:</div> <div>Zero IF Infrastructure</div> <div>(U) Item 12:</div> <div>Zero IF Infrastructure</div> <div>(U) Receiver Remarks:</div> <div>The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency</div> </div> |  |          |                                                                                                                             |                          |                                                                                                                                                                 |  |

## RECEIVER EQUIPMENT CHARACTERISTICS

translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |         |                                                                                                                                                                                      |                                                                                                                                                          |  |
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| <b>CLASSIFICATION</b> <b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         |                                                                                                                                                                                      | <b>Page 17 of 21</b>                                                                                                                                     |  |
| <b>RECEIVER EQUIPMENT CHARACTERISTICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         |                                                                                                                                                                                      |                                                                                                                                                          |  |
| <b>1. NOMENCLATURE, MANUFACTURER'S MODEL NO.</b><br>(U)    ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |         | <b>2. MANUFACTURER'S NAME</b><br>(U)    Fortress Technologies                                                                                                                        |                                                                                                                                                          |  |
| <b>3. RECEIVER INSTALLATION (U)</b><br>Internal ITE equipment or external pole mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |         | <b>4. RECEIVER TYPE</b><br>(U)    Wi-Fi 802.11a/n receiver in 4.4 GHz range                                                                                                          |                                                                                                                                                          |  |
| <b>5. TUNING RANGE (U)</b><br>4.410 GHz - 4.810 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |         | <b>6. METHOD OF TUNING</b><br>(U)    RF channeling capability is SW controlled<br>*(See Remarks)                                                                                     |                                                                                                                                                          |  |
| <b>7. RF CHANNELING CAPABILITY</b><br>(U)    4.410 GHz, 20 MHz increments, 21 channels;<br>*(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         | <b>8. EMISSION DESIGNATORS (U)</b><br><div style="display: flex; justify-content: space-between;"> <span>16M5D1D</span> <span>33M1D1D</span> </div>                                  |                                                                                                                                                          |  |
| <b>9. FREQUENCY TOLERANCE</b><br>(U) 10 ppm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |         | <b>11. RF SELECTIVITY</b><br><div style="display: flex; align-items: center;"> <input type="checkbox"/> Calculated         <input checked="" type="checkbox"/> Measured       </div> |                                                                                                                                                          |  |
| <b>10. IF SELECTIVITY</b><br>*(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1st (U)  | 2nd (U) | 3rd (U)                                                                                                                                                                              | <b>a. -3 dB</b> (U) 15 MHz<br><b>b. -20 dB</b> (U) 20 MHz<br><b>c. -60 dB</b> (U) 30 MHz<br><b>d. Preselection Type</b> (U) OFDM and adaptive modulation |  |
| <b>a. -3 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 700 MHz  | NA      | NA                                                                                                                                                                                   |                                                                                                                                                          |  |
| <b>b. -20 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1200 MHz | NA      | NA                                                                                                                                                                                   |                                                                                                                                                          |  |
| <b>c. -60 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4000 MHz | NA      | NA                                                                                                                                                                                   |                                                                                                                                                          |  |
| <b>12. IF FREQUENCY</b> *(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |         | <b>13. MAXIMUM POST DETECTION FREQUENCY (U)</b><br>NA                                                                                                                                |                                                                                                                                                          |  |
| <b>a. 1st</b> (U) NA<br><br><b>b. 2nd</b> (U) NA<br><br><b>c. 3rd</b> (U) NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |         | <b>14. MINIMUM POST DETECTION FREQUENCY (U)</b><br>NA                                                                                                                                |                                                                                                                                                          |  |
| <b>15. OSCILLATOR TUNED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1st (U)  | 2nd (U) | 3rd (U)                                                                                                                                                                              | <b>17. SENSITIVITY</b>                                                                                                                                   |  |
| <b>a. ABOVE TUNED FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NA       | NA      | NA                                                                                                                                                                                   | <b>a. SENSITIVITY</b> (U)    -94 dBm                                                                                                                     |  |
| <b>b. BELOW TUNED FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NA       | NA      | NA                                                                                                                                                                                   | <b>b. CRITERIA</b> (U)    Manufacturing Spec                                                                                                             |  |
| <b>c. EITHER ABOVE OR BELOW THE FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NA       | NA      | NA                                                                                                                                                                                   | <b>c. NOISE FIG</b> (U)    3 dB                                                                                                                          |  |
| <b>16. MAXIMUM BIT RATE (U)</b> 135 Mbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |         | <b>d. NOISE TEMP</b> (U)    NA                                                                                                                                                       |                                                                                                                                                          |  |
| <b>18. DE-EMPHASIS (U)</b><br><div style="display: flex; align-items: center;"> <input type="checkbox"/> a. YES         <input checked="" type="checkbox"/> b. NO       </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |         | <b>19. IMAGE REJECTION (U)</b> NA                                                                                                                                                    |                                                                                                                                                          |  |
| <b>20. SPURIOUS REJECTION (U)</b> NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |         |                                                                                                                                                                                      |                                                                                                                                                          |  |
| <b>21. REMARKS</b> <div style="margin-top: 10px;">           (U) Item 6:<br/>           The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified.         </div> <div style="margin-top: 10px;">           (U) Item 7:<br/>           4.410 GHz, 20 MHz increments, 21 channels, standard 802.11a over 4.4GHz frequencies         </div> <div style="margin-top: 10px;">           (U) Item 10:<br/>           Zero IF Infrastructure         </div> <div style="margin-top: 10px;">           (U) Item 12:<br/>           Zero IF Infrastructure         </div> <div style="margin-top: 10px;">           (U) Receiver Remarks:<br/>           The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency         </div> |          |         |                                                                                                                                                                                      |                                                                                                                                                          |  |
| <b>CLASSIFICATION</b> <b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         |                                                                                                                                                                                      | <b>J/F 12/</b>                                                                                                                                           |  |

## RECEIVER EQUIPMENT CHARACTERISTICS

translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |         |                                                                                                                                                                                   |                                                                                                                                                          |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>CLASSIFICATION</b> <b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         |                                                                                                                                                                                   | <b>Page 19 of 21</b>                                                                                                                                     |  |
| <b>RECEIVER EQUIPMENT CHARACTERISTICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         |                                                                                                                                                                                   |                                                                                                                                                          |  |
| <b>1. NOMENCLATURE, MANUFACTURER'S MODEL NO.</b><br>(U)    ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |         | <b>2. MANUFACTURER'S NAME</b><br>(U)    Fortress Technologies                                                                                                                     |                                                                                                                                                          |  |
| <b>3. RECEIVER INSTALLATION (U)</b><br>Internal ITE equipment or external pole mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |         | <b>4. RECEIVER TYPE</b><br>(U)    Wi-Fi 802.11a/n receiver in 4.4 GHz range                                                                                                       |                                                                                                                                                          |  |
| <b>5. TUNING RANGE (U)</b><br>4.410 GHz - 4.810 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |         | <b>6. METHOD OF TUNING</b><br>(U)    RF channeling capability is SW controlled<br>*(See Remarks)                                                                                  |                                                                                                                                                          |  |
| <b>7. RF CHANNELING CAPABILITY</b><br>(U)    4.410 GHz, 20 MHz increments, 21 channels;<br>*(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         | <b>8. EMISSION DESIGNATORS (U)</b><br><div style="display: flex; justify-content: space-between;"> <span>16M5D1D</span> <span>33M1D1D</span> </div>                               |                                                                                                                                                          |  |
| <b>9. FREQUENCY TOLERANCE</b><br>(U) 10 ppm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |         | <b>11. RF SELECTIVITY</b><br><div style="display: flex; align-items: center;"> <input type="checkbox"/> Calculated    <input checked="" type="checkbox"/> Measured         </div> |                                                                                                                                                          |  |
| <b>10. IF SELECTIVITY</b><br>*(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1st (U)  | 2nd (U) | 3rd (U)                                                                                                                                                                           | <b>a. -3 dB</b> (U) 15 MHz<br><b>b. -20 dB</b> (U) 20 MHz<br><b>c. -60 dB</b> (U) 30 MHz<br><b>d. Preselection Type</b> (U) OFDM and adaptive modulation |  |
| <b>a. -3 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 700 MHz  | NA      | NA                                                                                                                                                                                |                                                                                                                                                          |  |
| <b>b. -20 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1200 MHz | NA      | NA                                                                                                                                                                                |                                                                                                                                                          |  |
| <b>c. -60 dB</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4000 MHz | NA      | NA                                                                                                                                                                                |                                                                                                                                                          |  |
| <b>12. IF FREQUENCY</b> *(See Remarks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |         |                                                                                                                                                                                   | <b>13. MAXIMUM POST DETECTION FREQUENCY (U)</b><br>NA                                                                                                    |  |
| <b>a. 1st</b> (U) NA<br><br><b>b. 2nd</b> (U) NA<br><br><b>c. 3rd</b> (U) NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |         |                                                                                                                                                                                   | <b>14. MINIMUM POST DETECTION FREQUENCY (U)</b><br>NA                                                                                                    |  |
| <b>15. OSCILLATOR TUNED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1st (U)  | 2nd (U) | 3rd (U)                                                                                                                                                                           | <b>17. SENSITIVITY</b>                                                                                                                                   |  |
| <b>a. ABOVE TUNED FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NA       | NA      | NA                                                                                                                                                                                | <b>a. SENSITIVITY</b> (U)    -94 dBm                                                                                                                     |  |
| <b>b. BELOW TUNED FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NA       | NA      | NA                                                                                                                                                                                | <b>b. CRITERIA</b> (U)    Manufacturing Spec                                                                                                             |  |
| <b>c. EITHER ABOVE OR BELOW THE FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NA       | NA      | NA                                                                                                                                                                                | <b>c. NOISE FIG</b> (U)    3 dB                                                                                                                          |  |
| <b>16. MAXIMUM BIT RATE (U)</b> 135 Mbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |         |                                                                                                                                                                                   | <b>d. NOISE TEMP</b> (U)    NA                                                                                                                           |  |
| <b>18. DE-EMPHASIS (U)</b><br><div style="display: flex; align-items: center;"> <input type="checkbox"/> a. YES    <input checked="" type="checkbox"/> b. NO         </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |         |                                                                                                                                                                                   | <b>19. IMAGE REJECTION (U)</b> NA                                                                                                                        |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |         |                                                                                                                                                                                   | <b>20. SPURIOUS REJECTION (U)</b> NA                                                                                                                     |  |
| <b>21. REMARKS</b> <div style="margin-top: 10px;">           (U) Item 6:<br/>           The equipment is tuned under software control via a management interface (GUI or command-line), through which the channel frequency is specified.         </div> <div style="margin-top: 10px;">           (U) Item 7:<br/>           4.410 GHz, 20 MHz increments, 21 channels, standard 802.11a over 4.4GHz frequencies         </div> <div style="margin-top: 10px;">           (U) Item 10:<br/>           Zero IF Infrastructure         </div> <div style="margin-top: 10px;">           (U) Item 12:<br/>           Zero IF Infrastructure         </div> <div style="margin-top: 10px;">           (U) Receiver Remarks:<br/>           The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency         </div> |          |         |                                                                                                                                                                                   |                                                                                                                                                          |  |
| <b>CLASSIFICATION</b> <b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |         |                                                                                                                                                                                   | <b>J/F 12/</b>                                                                                                                                           |  |

## RECEIVER EQUIPMENT CHARACTERISTICS

translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                       |                               |                                   |                                                                           |
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| APPLICATION FOR<br>SPECTRUM REVIEW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CLASSIFICATION<br><b>UNCLASSIFIED</b> |                               | DATE                              | J/F 12/                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                       |                               |                                   | Page 21 of 21                                                             |
| NTIA GENERAL INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |                               |                                   |                                                                           |
| 1. APPLICATION TITLE (U) Fortress Technologies ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |                               |                                   |                                                                           |
| 2. SYSTEM NOMENCLATURE (U) Fortress Technologies ES2440-3444                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |                               |                                   |                                                                           |
| 3. STAGE OF ALLOCATION (U) <input type="checkbox"/> a. STAGE 1 CONCEPTUAL <input type="checkbox"/> b. STAGE 2 EXPERIMENTAL <input type="checkbox"/> c. STAGE 3 DEVELOPMENTAL <input checked="" type="checkbox"/> d. STAGE 4 OPERATIONAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                               |                                   |                                                                           |
| 4. FREQUENCY REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                       |                               |                                   |                                                                           |
| a. FREQUENCY(IES) (U)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                       | b. EMISSION DESIGNATORS (U)   |                                   |                                                                           |
| 2.412 GHz - 2.462 GHz<br>5.180 GHz - 5.320 GHz<br>5.500 GHz - 5.580 GHz<br>5.660 GHz - 5.700 GHz<br>5.745 GHz - 5.825 GHz<br>4.950 GHz - 4.980 GHz<br>4.410 GHz - 4.810 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       | 22M0G1D<br>33M1D1D<br>16M5D1D |                                   |                                                                           |
| 5. PURPOSE OF SYSTEM, OPERATIONAL AND SYSTEM CONCEPTS (U) (WARTIME USE) (U)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |                               |                                   |                                                                           |
| Transmission of data communications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                       |                               |                                   | <input checked="" type="checkbox"/> a. YES <input type="checkbox"/> b. NO |
| 6. INFORMATION TRANSFER REQUIREMENTS (U) Data communications. Maximum bit rate 135 Mbps.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |                               |                                   |                                                                           |
| 7. ESTIMATED INITIAL COST OF THE SYSTEM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                               |                                   |                                                                           |
| 8. TARGET DATE FOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                               |                                   |                                                                           |
| a. APPLICATION APPROVAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       | b. SYSTEM ACTIVATION          |                                   | c. SYSTEM TERMINATION                                                     |
| 9. SYSTEM RELATIONSHIP AND ESSENTIALITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                               |                                   |                                                                           |
| 10. REPLACEMENT INFORMATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                       |                               |                                   |                                                                           |
| 11. RELATED ANALYSIS AND /OR TEST DATA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |                               |                                   |                                                                           |
| 12. NUMBER OF MOBILE UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |                               |                                   |                                                                           |
| 13. GEOGRAPHICAL AREA FOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                       |                               |                                   |                                                                           |
| a. STAGE 2 (U) NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                               |                                   |                                                                           |
| b. STAGE 3 (U) NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                               |                                   |                                                                           |
| c. STAGE 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |                               |                                   |                                                                           |
| 14. LINE DIAGRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |                               | 15. SPACE SYSTEMS                 |                                                                           |
| 16. TYPE OF SERVICE(S) FOR STAGE 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                               | 17. STATION CLASS(ES) FOR STAGE 4 |                                                                           |
| 18. REMARKS (U) NTIA Remarks:<br>The Fortress ES2440-3444 is a POE powered Four Radio Access Point/Bridge. It embeds four COTS High Power MIMO Radio modules in a ruggedized enclosure. One radio is a 802.11 a/b/g/n. The other 3 radios are 802.11a/n over the 4.4 GHz frequency band. The front-end is based on up and down converter stages for 4.4/5.8 frequency translation. External Antennas are attachable by N-Type connectors. A kit will be provided with required accessories. The unit can be configured for point-to-point, multi-point, single and dual homed and wireless bridging/MESH applications. The radio transmitter technology is comprised of COTS Atheros Chipset (802.11MAC, adaptive modulation supporting and based-band processor - OFDM), power amplifier (SiGe) and duplexer device connecting output stage to the antenna port. The radio cards are COTS and based on mPCI form factor. |                                       |                               |                                   |                                                                           |

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| DOWNGRADING INSTRUCTIONS | J/F 12/                               |
|                          | CLASSIFICATION<br><b>UNCLASSIFIED</b> |