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FCC PART 90 RADAR

C2PC TEST REPORT

APPLICANT	**Enterprise Electronics Corporation**
	128 South Industrial Blvd. **Enterprise Alabama 36330 USA**
FCC ID	BUVRANGERX5
MODEL NUMBER	Ranger X5
PRODUCT DESCRIPTION	Ranger-X5 RADAR
DATE SAMPLE RECEIVED	4/7/2017
FINAL TEST DATE	4/12/2017
TESTED BY	Cory Leverett
APPROVED BY	Sid Sanders
TEST RESULTS	☒ PASS ☐ FAIL

Report Number	Version Number	Description	Issue Date
569UT17TestReport_	Rev1	Initial Issue	4/13/2017

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.

☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Enterprise Electronics Corporation
128 South Industrial Blvd.
Enterprise Alabama 36330 USA

Tested by:
Name and Title: Cory Leverett , Project Manager/Testing Technician
Date: 04/12/2013

Reviewed and approved by:

Name and Title: Sid Sanders, Engineer

Date: 4/13/17

EUT SPECIFICATION

EUT Description	Ranger-X5 RADAR
FCC ID	BUVRANGERX5
Model Number	Ranger X5
Operating Frequency	9200 – 9600 MHz
Type of Emission	6M80P0N
Modulation	Pulse Compression FM
EUT Power Source	☐ 110–240Vac/50– 60Hz
	☒ DC Power (48 VDC)
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☐ Pre-Production
	☒ Production
Type of Equipment	☒ Fixed
	☐ Mobile
	☐ Portable
Antenna	1.8 Meter Parabolic Reflector with dual polarization tuned feed horn Option 1: 1.0 Meter diameter – Gain 36.0 ± 0.5 dBi Option 2: 1.8 Meter diameter - Gain 42.0 ± 0.5 dBi Option 3: 2.4 Meter diameter - Gain 44.5 ± 0.5 dBi

TEST SETUP INFORMATION

Test Condition	The EUT was tested under normal temperature and humidity. The temperature was 20-26ºC with a relative humidity of 35 - 55%.
Modifications	None
Test Exercise	The EUT was transmitting a modulated pulse with a 100 us pulse at a 1200 Hz rep rate. This produced the highest duty cycle and worst case emission.
Regulatory Standards	FCC CFR 47 Part 2, 90
Measurement Standards	TIA_603-D:2010, ANSI C63.4: 2013 KDB 662911 D01 MULTIPLE TRANSMITTER OUTPUT V02R01,

Rule Part No.	Test Item	Status Pass/Fail/NA
2.1046, 90.205	RF Power Output	Pass
2.1051, 90.210 (b)(3)	Antenna Conducted Emissions	Pass
2.1053, 90.210(b)(3)	Field Strength Spurious Emissions	Pass

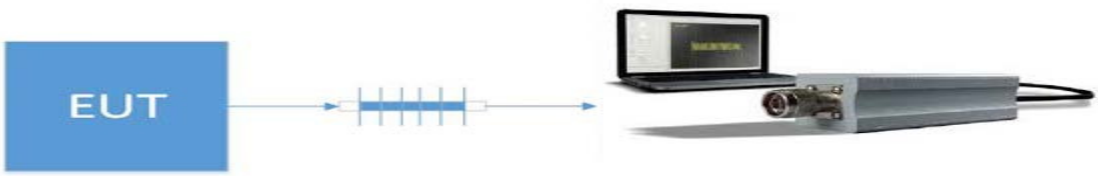
RF POWER OUTPUT

Rule Part No.: 2.1046, 90.205

Requirements: Manufacturers specifications

Procedure: RF power is measured by connecting a 50-ohm, Peak Power Watt meter to the RF output connector. The EUT was supplied with a nominal voltage, and the transmitter properly adjusted for the target output power.

Setup Diagram:



Notes: The EUT has 2 transmitters; all conducted measurement results are summed and compared to the limit following the procedures listed above

The mean power was calculated based on formula:

Pa = Pm * DC

Pa is Mean linear power in watts
Pm is Peak linear power in watts
DC is duty cycle in %

Example: 404.79 (W) * (91.6/833) = 44.51 (w)

Test Data: **Measurement Table**

Tuned Freq (MHz)	Pulse Type	T_d (uSec)	Period (uSec)	DC (%)	Ant 1 Peak Power (dBm)	Ant 2 Peak Power (dBm)	Ant 1 + 2 Peak Power (W)	Ant 1 + 2 Mean Power (W)
9265	100 uS	91.98	837.17	10.99%	53.19	52.75	396.81	43.60
9450	100uS	91.98	837.17	10.99%	53.12	52.91	400.55	44.01
9550	100 uS	91.98	837.17	10.99%	53.02	52.92	396.33	43.55
9265	2 uS	1.50	837.17	0.18%	57.10	56.76	987.10	1.77
9450	2uS	1.50	837.17	0.18%	57.13	56.78	992.85	1.78
9550	2 uS	1.50	837.17	0.18%	57.04	56.75	978.98	1.75

Part 2.1033 (C) (8) DC Input into the final amplifier

INPUT POWER: P(W) = E(V) * I(A) = 48 VDC * 44.6 Amps = 2040 Watts

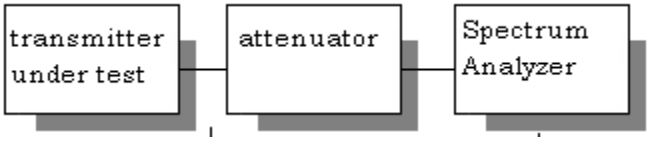
SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Rule Part No.: 2.1051, 90.210 (b)(3)

Requirements: 43+ 10log (P)

Procedure: The spectrum was scanned from9 KHz - 40 GHz. The measurements were made in accordance with standard that is listed above.

Setup Diagram:



Notes: Only emissions that are within 20 dB of the limit are reported

Test Data: **Low End of Band Measurement Table**

Peak Power Output			
Tuned Frequency (MHz)	Ant 1 +2 (dBm)	Ant 1 +2 (W)	Limit (dBc)
9265	59.94	987.10	72.94
Emission Frequency (MHz)	Ant 1+2 Level (dBm)	Ant 1 + 2 Level (dBc)	Margin (dB)
18530	-13.94	73.88	0.94
27795	-34.59	94.53	21.59
37060	-41.59	101.53	28.58

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Data: Middle of Band Measurement Table

Peak Power Output			
Tuned Frequency (MHz)	Ant 1 +2 (dBm)	Ant 1 +2 (W)	Limit (dBc)
9450	59.97	992.85	72.97
Emission Frequency (MHz)	Ant 1+2 Level (dBm)	Ant 1 + 2 Level (dBc)	Margin (dB)
18900	-30.49	90.46	17.49
28350	-42.59	102.56	29.59
37800	-43.21	103.18	30.21

Test Data: High End of Band Measurement Table

Peak Power Output			
Tuned Frequency (MHz)	Ant 1 +2 (dBm)	Ant 1 +2 (W)	Limit (dBc)
9550	59.91	978.98	72.91
Emission Frequency (MHz)	Ant 1+2 Level (dBm)	Ant 1 + 2 Level (dBc)	Margin (dB)
19100	-39.52	99.43	26.52
28650	-40.07	99.98	27.07
38200	-41.93	101.84	28.93

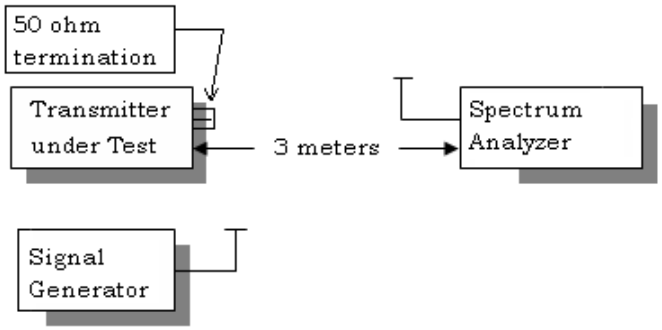
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: 2.1053, 90.210(b)(3)

Requirements: 43+10log (P)

Procedure: The tabulated data shows the results of the substitution measurement of radiated field strength emissions test. The spectrum was scanned from 9 KHz - 40 GHz.

Setup Diagram:



Notes: Only emissions that are within 20 dB of the limit are reported

Test Data: **Low End of Band Measurement Table**

Tuned Frequency (MHz)	Power Mode (Hi/Lo)	Power Output (dBm)	Power Output (Watts)	FCC Requirement (dB)	Measured BW (MHz)
9265	Hi	59.94	987.10	72.94	6.80

Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)	Margin
18,530.00	V	104.7	31.76
27,795.00	H	114.5	41.56
37,060.00	H	115.5	42.56

Test Data: Middle of Band Measurement Table

Tuned Frequency (MHz)	Power Mode (Hi/Lo)	Power Output (dBm)	Power Output (Watts)	FCC Requirement (dB)	Measured BW (MHz)
9450	Hi	59.97	992.85	72.97	6.80
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)			Margin
18,900.00	V	96.49			23.52
28,350.00	H	111.18			38.21
37,800.00	H	115.62			42.65

Test Data: High End of Band Measurement Table

Tuned Frequency (MHz)	Power Mode (Hi/Lo)	Power Output (dBm)	Power Output (Watts)	FCC Requirement (dB)	Measured BW (MHz)
9275	Hi	59.91	978.98	72.91	6.80
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)			Margin
18,550.00	V	103.49			30.58
27,825.00	H	113.16			40.25
37,100.00	H	115.56			42.65

EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Attenuator K 6dB W DC-	Narda	476-6	044-3	06/25/15	06/25/17
Antenna: Biconical 1096 Chamber	Eaton	94455-1	1096	07//15	07/14/17
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/14/15	07/14/17
Antenna: Dipole Kit 153	Electro-Metrics	TDA-30/1-4	153		
Digital Multimeter	Fluke	77	35053830	10/21/15	10/21/17
Antenna: Standard Gain Horn 1.0-2.4 GHz	Polarad	CA-L	5	NA	NA
Antenna: Standard Gain Horn 2.14-4.34 GHz	Polarad	CA-S	203	NA	NA
Antenna: Standard Gain Horn 3.95-5.85 GHz	Scientific-Atlanta Inc.	12-3.9	8105CF	NA	NA
Antenna: Standard Gain Horn 8.2-12.5 GHz	Systron Donner	DBG-520-20	Not Serialized	NA	NA
Antenna: Standard Gain Horn 18.0-26.3 GHz	Systron Donner	DBE-520-20	Not Serialized	NA	NA
Antenna: Standard Gain Horn 26.5-40.2 GHz	Systron Donner	DBD-520-20	Not Serialized	NA	NA
Antenna: Standard Gain Horn 5.85-8.2 GHz	ATM	137-442-2	D261908-01	NA	NA
Coaxial Cable - Chamber 3 cable set (backup)	Micro-Coax	Chamber 3 cable set (backup)	KMKM-0244-02 ; KMKM-0670-01; KFKF-0197-00	NA	NA
Sweep/Signal Generator	Anritsu	68369B	985112	10/28/15	10/28/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren Chamber	3117	00041534	02/25/15	02/25/17
Software: Field Strength Program	Timco	N/A	Version 4.0	NA	NA
Antenna: Active Loop	ETS-Lindgren	6502	00062529	11/18/15	11/18/17
USB Peak Power Sensor 50 MHz to 18 GHz	Boonton	55318	9224	09/13/16	09/13/18
Coaxial Cable #103 - KMKM-0180-01 Aqua	Micro-Coax	UFB142A-0-0720-200200	225363-002 (#103)	08/05/15	08/05/17
Type K J	Martel	303	080504494	10/26/15	10/26/17

Thermometer					
EMI Test Receiver R & S ESIB 40	Rohde & Schwarz	ESIB 40	100274	08/16/16	08/16/18
High Pass Filter 18GHz	Micro-Tronics	HPS18771	-002	05/13/16	05/13/18
Adapter Waveguide WR-42 to Waveguide WR-90	ATM	42/90-8-6-6	S539408-01	NA	NA
Adapter Waveguide WR-62 to Coax SMA	ATM	62-251A-6	S539808-01	NA	NA
Adapter Waveguide WR-28 to Waveguide WR-90	ATM	28/90-8-6-6	S539708-01	NA	NA
Directional Coupler 20dB	HP	X752D	1829A24209	NA	NA
Adapter Waveguide WR-62 to Waveguide WR-90	ATM	62/90-6-6-6	S539608-01	NA	NA
Adapter Waveguide WR-28 to Coax K	ATM	28-25KZA-6	S539908-01	NA	NA
Attenuator K 6dB 2W DC-40G	Narda	4768-6	1044-2	06/25/15	06/25/17
Attenuator N 30dB 20W DC-4G	CLASS III	34078	M3933/10-5	05/19/15	05/19/17
Adapter Waveguide WR-42 to Coax K	ATM	42-25KA-6	S539508-01	NA	NA
Low Pass Filter WR-90 9.4 GHz	UNK	WR-90 9.4 GHz	N/A	07/27/16	07/27/18
High Pass Filter 980MHz	Microlab	HA-20N	NA	NA	06/17/17
Antenna: Double-Ridged Horn 18-40 GHz	EMCO	3116	9011-2145	11/18/15	11/18/17

* EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

END OF REPORT