



Certification Test Report

FCC ID: YKD-25STW4100-019

FCC Rule Part: CFR 47 Part 90, DA 09-2482

Report Number: BO72128221.100

Applicant: L-3 Communications CyTerra Corporation

Model(s): Range-R 2D and Range-R 2D Link

Test Begin Date: April 26, 2017

Test End Date: June 5, 2017

Report Issue Date: July 20, 2017



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, ANSI, or any agency of the Federal Government.

Prepared by:

A handwritten signature in blue ink, appearing to read "Thierry Jean-Charles".

**Thierry Jean-Charles
Team Lead
TÜV SÜD America, Inc.**

Reviewed by:

A handwritten signature in blue ink, appearing to read "Ryan McGann".

**Ryan McGann
Senior Engineer
TÜV SÜD America, Inc.**

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This report contains 15 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with CFR 47 Part 90 of the FCC's Code of Federal Regulations in accordance with waiver DA 09-2482 for a permissive change.

The purpose of the permissive change is to document the addition a model variant as well as emissions degradation following the depopulation of components of the digital circuit of the device. There are no changes on the RF circuit and the RF power output of the product.

1.2 Manufacturer Information

L-3 Communications CyTerra Corporation
7558 Southland Blvd, Suite 130
Orlando, FL 32809

1.3 Product Description

The RANGE-R 2D is a stepped-frequency continuous-wave (SFCW), handheld radar for motion detection of human targets through walls constructed of common building materials. The system application includes room clearance operations and victim location by search and rescue personnel engaged in disaster recovery efforts.

The system is comprised of a stepped-frequency continuous wave (SFCW) radar transceiver, digital signal processor (DSP), display and power supply electronics enclosed in a rugged, water-resistant, light-weight plastic housing. The operator controls consist solely of the two momentary pushbutton switches located on the sides of the unit.

The RANGE-R 2D cycles through a sequence of frequencies from 3.1 GHz to 3.5 GHz. At each of the frequencies, it transmits a maximum CW power level of 31.6 milliwatts with no modulation.

The Range-R2D Link differs from the Range-R2D by providing WLAN capabilities and an external connector allowing the use of an external power supply. The WLAN module (FCC ID: YKD25STW4100-029) is present in both models but is only active within the Range-R2D Link variant.

Test Sample Serial Numbers: 1

Test Sample Condition: The unit was in good physical condition with no visible damages.

1.4 Test Methodology

1.4.1 Configurations and Justification

The purpose of the permissive change is to evaluate the impact of depopulation of components of the digital circuits of device. Therefore, the EUT was evaluated for radiated emissions only.

The EUT was evaluated for radiated emissions in the orientation of typical use with the stepped-frequency function disabled. Preliminary evaluation were performed between the two models and the worst case was used for the remaining measurements. The highest emissions were obtained with the Range-R 2D and are reported in this document. The data documented is deemed representative of both variants.

The Range-R 2D Link was also evaluated for intermodulation products generated by the simultaneous transmission of the WLAN module and the 3 GHz radar transceiver. All intermodulation products were observed to be compliant to the general limits of FCC 15.209.

The equipment was evaluated with a test software RF attenuation setting of 1.5 dB.

1.5 Emission Designators

The Range-R2D and Range-R2D Link consist of stepped-frequency continuous-wave transmitters (SFCW). The emission designators for the Radar transceiver are provided below.

EMISSIONS DESIGNATORS: N0N.

2 TEST FACILITIES**2.1 Location**

Unless otherwise noted, the radiated and conducted emissions test sites are located at the following addresses.

TÜV SÜD America, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
<http://www.tuv-sud-america.com>

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

FCC Test Firm Registration #: 475089
Innovation, Science and Economic Development Canada Lab Code: 4175C

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which can support a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1060 Multi-device controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

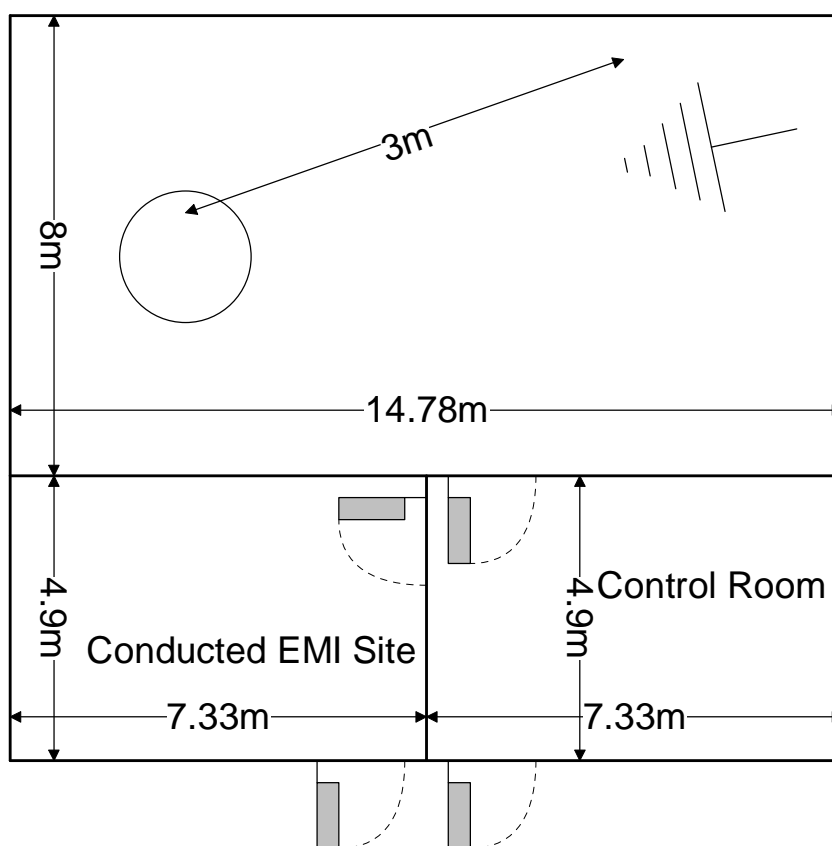


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m³. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50 Ω /50 μ H and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

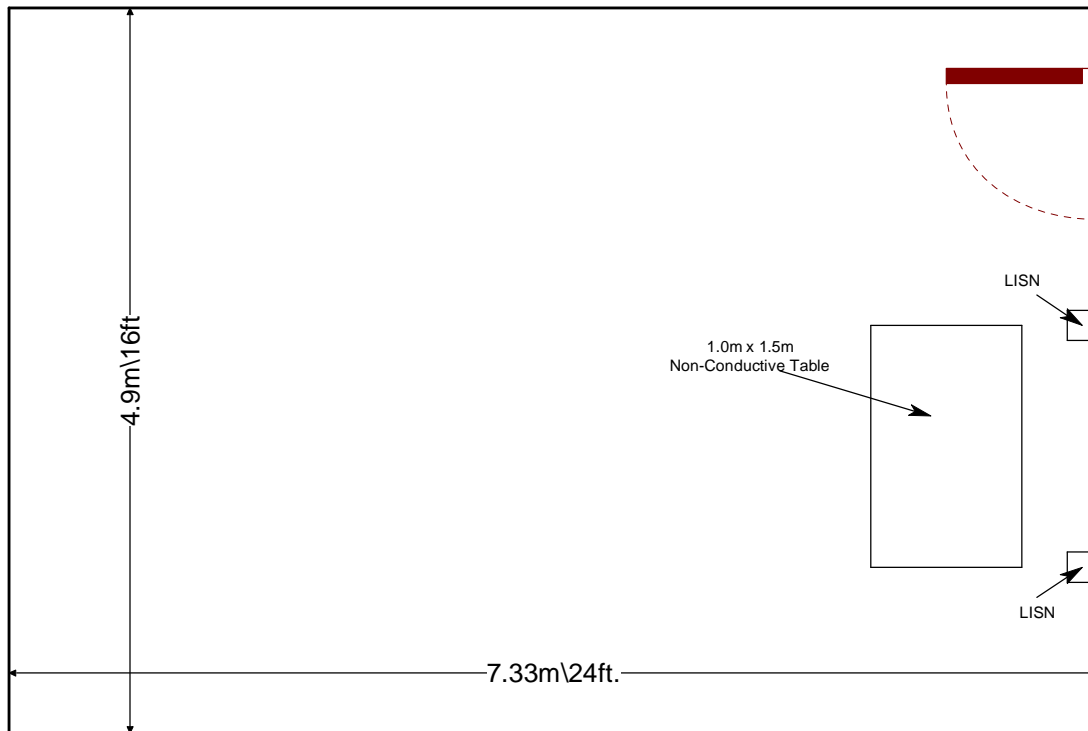


Figure 2.3.2-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- 1 - US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2017
- 2 - US Code of Federal Regulations (CFR): Title 47, Part 90: Private Land Mobile Services – 2017
- 3 – TIA-603-E: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2016
- 4 – ANSI C63.26: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services – December 2015

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: TÜV SÜD America Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
332	Rohde & Schwarz	TS-PR40	Amplifiers	100021	3/14/2016	3/14/2018
333	Rohde&Schwarz	3160-10	Antennas	45576	11/4/2010	NCR
347	Microwave Circuits	H07G18G3	Filters	171921	9/9/2016	9/9/2017
523	Agilent	E7405	Spectrum Analyzers	MY45103293	12/9/2016	12/9/2018
653	Suhner	SF-102A	Cables	0944/2A	9/6/2016	9/6/2017
2002	EMCO	3108	Antennas	2147	11/19/2015	11/19/2017
2003	EMCO	3108	Antennas	2148	2/29/2016	2/28/2018
2004	EMCO	3146	Antennas	1385	11/19/2015	11/19/2017
2005	FAU EMI R&D Lab	Lazarus	Antennas	EM001	2/16/2016	2/16/2018
2006	EMCO	3115	Antennas	2573	4/14/2015	4/14/2017
2006	EMCO	3115	Antennas	2573	4/7/2017	4/7/2019
2007	EMCO	3115	Antennas	2419	1/28/2016	1/28/2018
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	11/2/2016	11/2/2017
2082	Teledyne Storm Products	90-010-048	Cables	2082	4/7/2017	4/7/2018
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	11/2/2016	11/2/2017
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/2/2016	12/2/2017
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2101	Mini Circuits	VHF-6010+	Filter	2101	6/20/2016	6/20/2017
2101	Mini Circuits	VHF-6010+	Filter	2101	5/27/2017	5/27/2018
2121	ACS Boca	Radiated Cable Set	Cable Set	2121	8/1/2016	8/1/2017
2122	ACS Boca	Radiated Cable Set	Cable Set	2122	8/4/2016	8/4/2017
RE563	Hewlett Packard	8673D	Signal Generators	3034A01078	4/8/2016	4/8/2018

Notes:

- NCR = No Calibration Required
- The equipment calibration cycle information is provided to encompass the entire test period. The equipment was used only during the active cycle of the calibration.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	L-3 Communications CyTerra Corporation	Range-R2D	1

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
	The worst-case configuration was obtained with the Range-R2D which is a standalone equipment without any provision for connection to accessory equipment.			

6 EQUIPMENT UNDER TEST SETUP AND BLOCK DIAGRAM

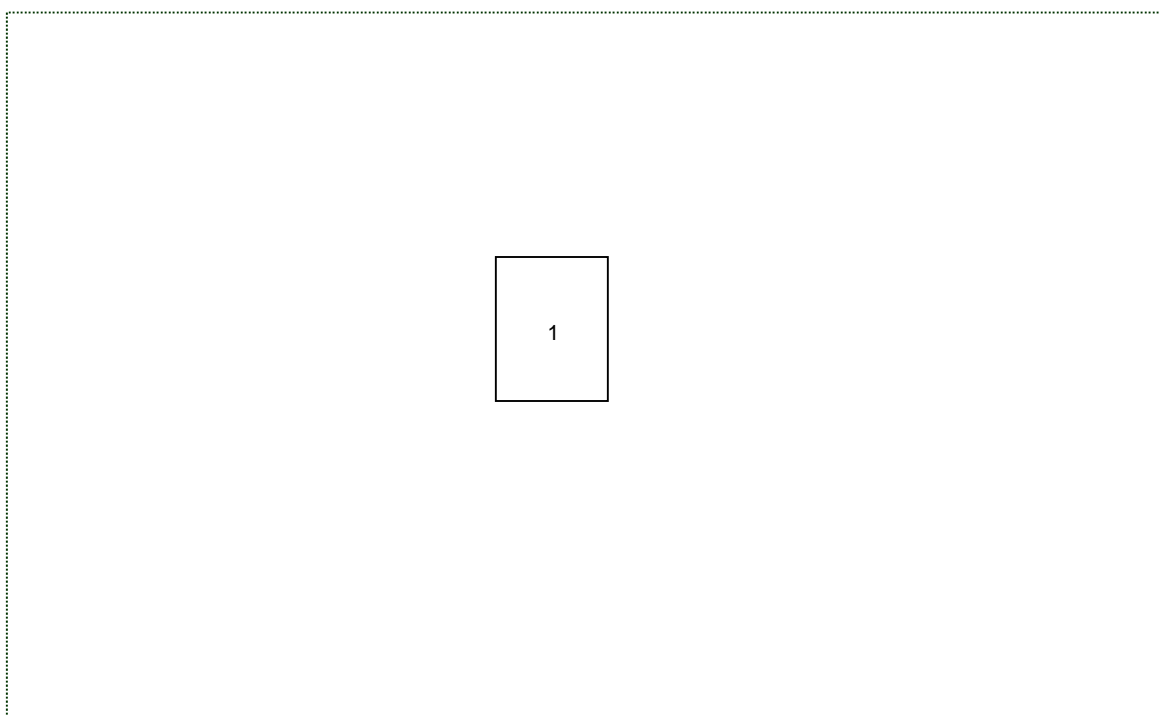


Figure 6-1: EUT Test Setup

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

Table 7-1: Test Results Summary

Test Parameter	Test Summary
Field Strength of Spurious Emissions	Pass

7.1 Field Strength of Spurious Emissions

7.1.1 Measurement Procedure

The equipment under test is placed in the Semi-Anechoic Chamber (described in section 2.3.1) on a RF transparent table at the turntable center. For each spurious emission, the antenna mast is raised and lowered from one (1) to four (4) meters and the turntable is rotated 360° and the maximum reading on the spectrum analyzer is recorded. This was repeated for both horizontal and vertical polarizations of the receive antenna.

The equipment under test is then replaced with a substitution antenna fed by a signal generator. The signal generator's frequency is set to that of the spurious emission recorded from the equipment under test. The antenna mast is raised and lowered from one (1) to four (4) meters to obtain a maximum reading on the spectrum analyzer. The output of the signal generator is then adjusted until the reading on the spectrum analyzer matches that obtained from the equipment under test. The signal generator level is recorded. The power in dBm of each spurious emission is calculated by correcting the signal generator level for the cable loss and gain of the substitution antenna referenced to a dipole. The spectrum was investigated in accordance to CFR 47 Part 2.1057.

The magnitude of all spurious emissions not reported were attenuated below the noise floor of the measurement system and therefore not specified in this report. Results are shown below.

7.1.2 Measurement Results

Performed by: Thierry Jean-Charles

FCC CFR 47 Part 90, DA 09-2482

Table 7.5.2-1: Field Strength of Spurious Emissions – 3101 MHz

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1781	-51.37	H	-45.42	-13.00	32.42
2640	-52.03	H	-41.78	-13.00	28.78
3562	-41.46	H	-23.32	-13.00	10.32
6202	-32.77	H	-15.61	-13.00	2.61
6662.875	-56.56	H	-33.07	-13.00	20.07
7322.87	-56.27	H	-33.94	-13.00	20.94
9303	-57.87	H	-41.72	-13.00	28.72
12404	-63.35	H	-48.76	-13.00	35.76
15505	-59.03	H	-43.37	-13.00	30.37
1781	-53.57	V	-49.33	-13.00	36.33
2640	-52.96	V	-42.76	-13.00	29.76
3562	-40.73	V	-23.44	-13.00	10.44
6202	-31.49	V	-14.73	-13.00	1.73
6662.875	-56.13	V	-33.03	-13.00	20.03
7322.87	-56.22	V	-34.86	-13.00	21.86
9303	-54.53	V	-36.29	-13.00	23.29
12404	-62.63	V	-47.84	-13.00	34.84
15505	-61.23	V	-45.95	-13.00	32.95

NOTE: All frequencies not listed were below the limits and the noise floor of the measurement equipment.

Table 7.5.2-2: Field Strength of Spurious Emissions – 3299 MHz

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
1979	-50.17	H	-42.43	-13.00	29.43
2639	-53.62	H	-44.77	-13.00	31.77
3159	-53.27	H	-41.50	-13.00	28.50
6598	-34.91	H	-16.68	-13.00	3.68
9897	-62.13	H	-47.19	-13.00	34.19
13196	-61.62	H	-43.31	-13.00	30.31
16495	-64.08	H	-51.48	-13.00	38.48
19794	-63.15	H	-51.17	-13.00	38.17
1979	-51.11	V	-43.34	-13.00	30.34
2639	-53.70	V	-44.12	-13.00	31.12
3159	-53.81	V	-41.99	-13.00	28.99
6598	-34.45	V	-16.70	-13.00	3.70
9897	-60.56	V	-45.10	-13.00	32.10
13196	-60.95	V	-43.40	-13.00	30.40
16495	-64.99	V	-52.59	-13.00	39.59
19794	-63.50	V	-51.52	-13.00	38.52

NOTE: All frequencies not listed were below the limits and the noise floor of the measurement equipment

Table 7.5.2-3: Field Strength of Spurious Emissions – 3499 MHz

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
6998	-34.06	H	-17.81	-13.00	4.81
13996	-54.57	H	-37.62	-13.00	24.62
2179	-48.31	H	-40.27	-13.00	27.27
2839	-34.42	H	-20.28	-13.00	7.28
3359	-54.58	H	-40.84	-13.00	27.84
4159	-58.60	H	-43.23	-13.00	30.23
6338	-53.85	H	-40.10	-13.00	27.10
8517	-56.31	H	-40.42	-13.00	27.42
20994	-63.75	H	-50.87	-13.00	37.87
6998	-32.15	V	-16.20	-13.00	3.20
13996	-54.97	V	-39.21	-13.00	26.21
2179	-47.92	V	-38.14	-13.00	25.14
2839	-36.01	V	-21.45	-13.00	8.45
3359	-54.85	V	-40.30	-13.00	27.30
4159	-56.57	V	-39.51	-13.00	26.51
6338	-55.23	V	-42.51	-13.00	29.51
8517	-51.94	V	-35.30	-13.00	22.30
20994	-63.52	V	-50.64	-13.00	37.64

NOTE: All frequencies not listed were below the limits and the noise floor of the measurement equipment

8 MEASUREMENT UNCERTAINTIES

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) $k = 1.96$ which provide confidence levels of 95%.

Parameter	U_{lab}
Occupied Channel Bandwidth	$\pm 0.009 \%$
RF Conducted Output Power	$\pm 0.349 \text{ dB}$
Power Spectral Density	$\pm 0.372 \text{ dB}$
Antenna Port Conducted Emissions	$\pm 1.264 \text{ dB}$
Radiated Emissions $\leq 1\text{GHz}$	$\pm 3.93 \text{ dB}$
Radiated Emissions $> 1\text{GHz}$	$\pm 5.814 \text{ dB}$
Temperature	$\pm 0.860 \text{ }^{\circ}\text{C}$
Radio Frequency	$\pm 2.832 \times 10^{-8}$
AC Power Line Conducted Emissions	$\pm 2.93 \text{ dB}$

9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the models Range-R 2D and Range-R 2D Link , manufactured by L-3 Communications CyTerra Corporation , meet the requirements of FCC CFR 47 Part 90, DA 09-2482 for the tests documented herein.

End Report