Excellence in Compliance Testing

Certification Test Report

FCC ID: YKD-25TWD3000

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

ACS Report Number: 10-0003.W03.11.A

Applicant: L-3 Communications CyTerra
Model: RANGE-R

Test Begin Date: July 12, 2010
Test End Date: July 16, 2010

Report Issue Date: August 7, 2010

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

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

Reviewed by: _____
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 19 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 2 Subpart J, Part 90 of the FCC's Code of Federal Regulations in accordance with waiver DA 09-2482.

1.2 Product description

The RANGE-R™ system is a highly sensitive, portable, handheld, battery operated system. It is designed to detect moving and near stationary personnel through walls constructed of common building materials. Anticipated uses of the RANGE-R™ system include 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 cycles through a sequence of 120 frequencies in 2 MHz increments from 3.18 GHz to 3.42 GHz. At each of the frequencies, it transmits a maximum 32mW power level with no modulation.

Manufacturer Information:
L-3 Communications CyTerra
10 Commerce Way
WoBum, MA 01801

Test Sample Serial Numbers: 0107-1193

Test Sample Condition: The test samples were provided in good working order with no visible defects.

Detailed photographs of the EUT are filed separately with this filing.

1.3 Test Methodology and Considerations

The RANGE-R was tested with the stepped-frequency function disabled with measurements made at the low, middle and high end of the stepped-frequency range.

The RANGE-R was test for radiated emissions in the orientation utilized in normal operation. The EUT was connected to an external power supply operating at 6VDC for the duration of the tests.

1.4 Emission Designator

The RANGE-R produces a stepped-frequency continuous-wave (SFCW) signal.

Emissions Designator: N0N

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

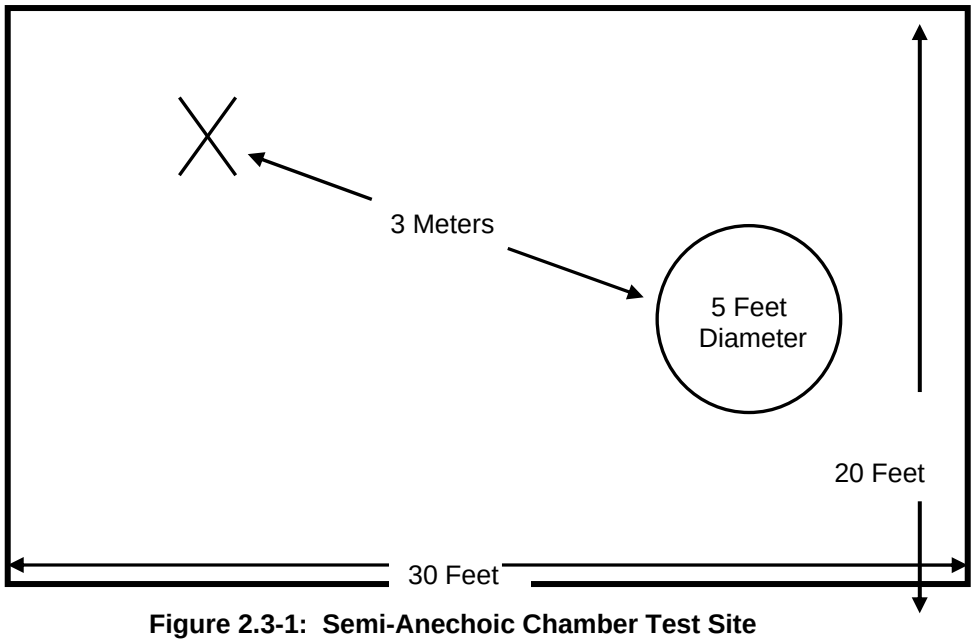

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

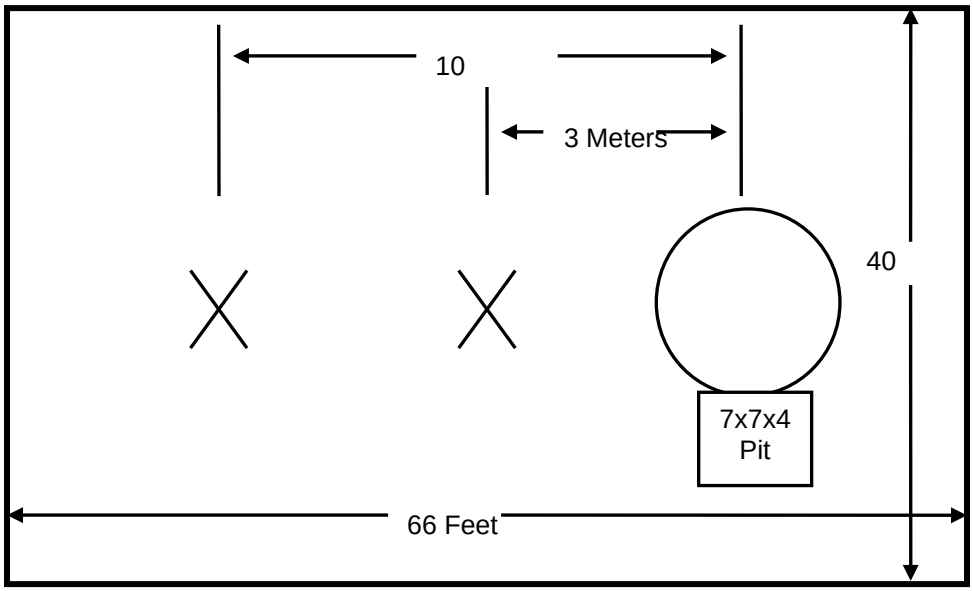

Figure 2.3-2: Open Area Test Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz - 2003
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures – 2010
- US Code of Federal Regulations (CFR): Title 47, Part 90: Private Land Mobile Radio Services – 2010
- TIA-603-C: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2004

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: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-21-2010
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-21-2010
25	Chase	Antennas	CBL6111	1043	09-02-2010
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2011
73	Agilent	Amplifiers	8447D	2727A05624	05-26-2011
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-25-2011 (See Note1)
267	Agilent	Power Meter	N1911A	MY45100129	11-16-2010
268	Agilent	Power Sensor	N1921A	MY45240184	11-16-2010
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2010 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2010 (See Note1)
329	A.H.Systems	Antennas	SAS-571	721	08-04-2011
332	Rohde & Schwarz	Amplifier	TS- PR40	100021	10-16-2010
333	Rohde & Schwarz	Antennas	3160-09	00049404	No Cal Req
334	Rohde & Schwarz	Antennas	3160-10	00045576	No Cal Req
335	Suhner	Cables	SF-102A	882/2A	10-16-2010
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10-16-2010
340	Weinschel	Attenuators	AS-20	7136	10-16-2010 (See Note2)
346	Weinschel	Attenuators	54A-10	T1362	09-02-2010 (See Note2)
347	Microwave Circuits	Filter	H07G18G3	171921	10-16-2010 (See Note1)
362	Microwave Circuits	Filter	H18G26G1	210078	10-16-2010 (See Note1)
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	01-26-2011 (See Note1)
426	Thermotron	Temp. Chamber	S-8 Mini Max	25-2888-10	08-30-2010
RE35	Agilent	Signal Generator	E8257D	MY46521942	No Cal Req
RE39		Spectrum Analyzer	FSU46	200009	07-27-2011

Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.
Note2: Items verified on an annual cycle. The date shown indicates the next verification due date.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Manufacturer	Equipment Type	Model Number	Serial Number
1	OK Industries	DC Power Supply	PS73C	36095

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

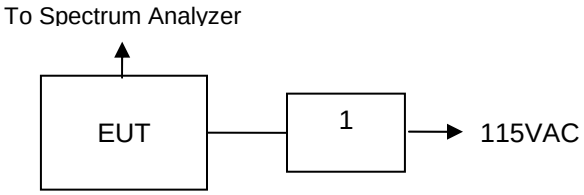

Figure 1: Frequency Stability / Output Power / Occupied Bandwidth Test Setup

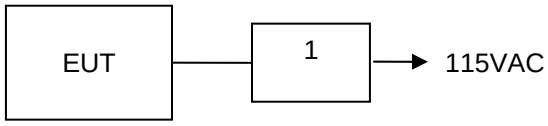

Figure 2: Radiated Emissions Test Setup

7 SUMMARY OF TESTS

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

7.1 RF Power Output

7.1.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the power meter through a 10 dB passive attenuator. The internal correction factors of the power meter were employed to correct for any cable or attenuator losses. Results are shown below.

7.1.2 Measurement Results

Table 7.1.2-1: Peak Output Power

Frequency (MHz)	Output Power (dBm)
3180	14.24
3300	14.15
3420	13.91

7.2 Occupied Bandwidth (Emission Limitations)

7.2.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through a 10 dB passive attenuator. The spectrum analyzer resolution and video bandwidths were set to 10 Hz and 30 Hz respectively. The internal correction factors of the spectrum analyzer were employed to correct for any cable or attenuator losses. The emission limitations per DA 09-2482 were measured with both narrow and wide spans to cover the range of in-band emission limitations.

7.2.2 Measurement Results

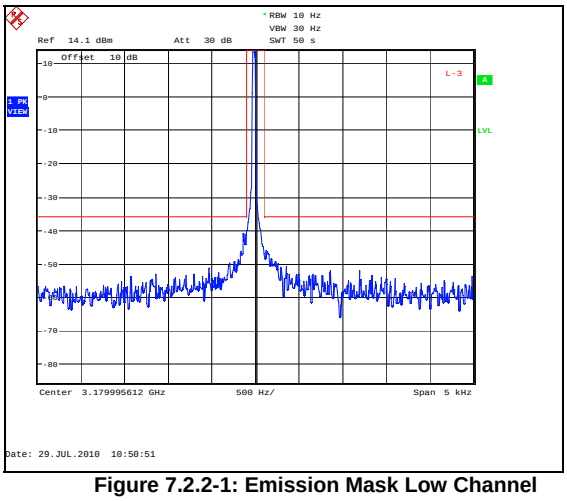

Figure 7.2.2-1: Emission Mask Low Channel

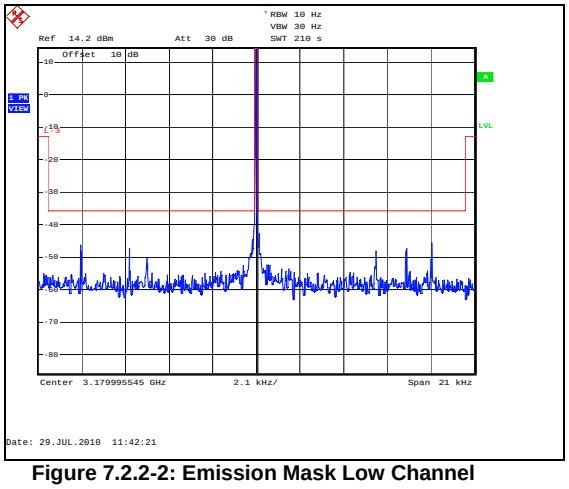

Figure 7.2.2-2: Emission Mask Low Channel

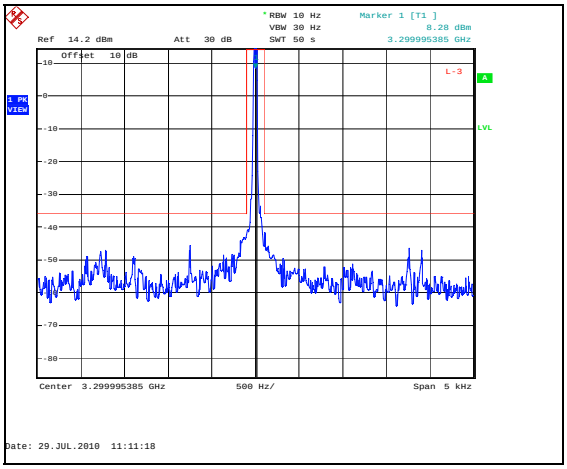

Figure 7.2.2-3: Emission Mask Mid Channel

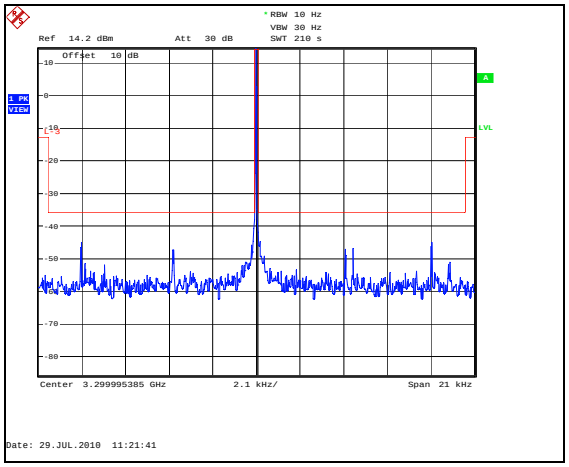

Figure 7.2.2-4: Emission Mask Mid Channel

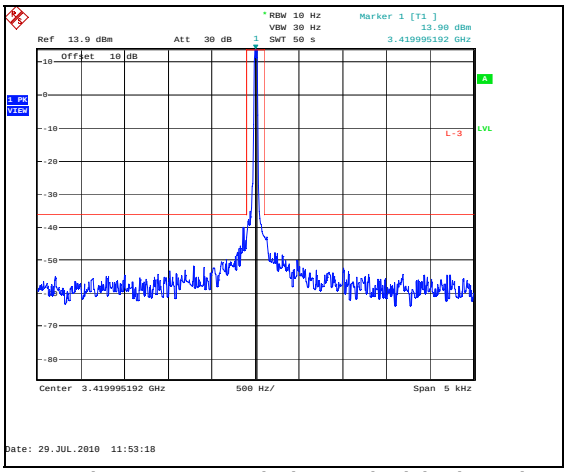

Figure 7.2.2-5: Emission Mask High Channel

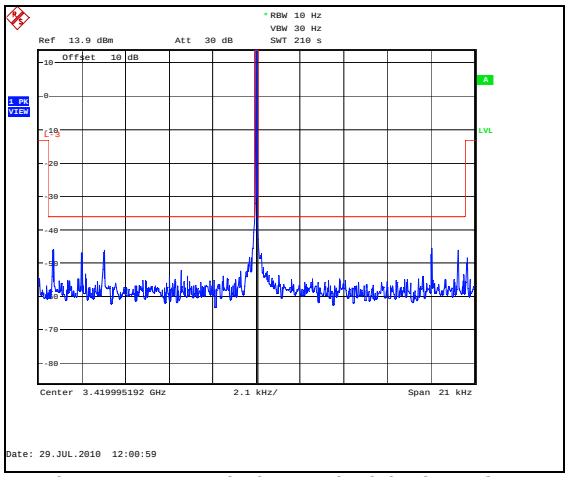

Figure 7.2.2-6: Emission Mask High Channel

7.3 Spurious Emissions at Antenna Terminals

7.3.1 Measurement Procedure

The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer through a 10 dB passive attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz below 1000MHz and 1 MHz above 1000 MHz. The internal correction factors of the spectrum analyzer were employed to correct for any cable or attenuator losses. The spectrum was investigated in accordance to CFR 47 Part 2.1057. Results of the test are shown below.

7.3.2 Measurement Results

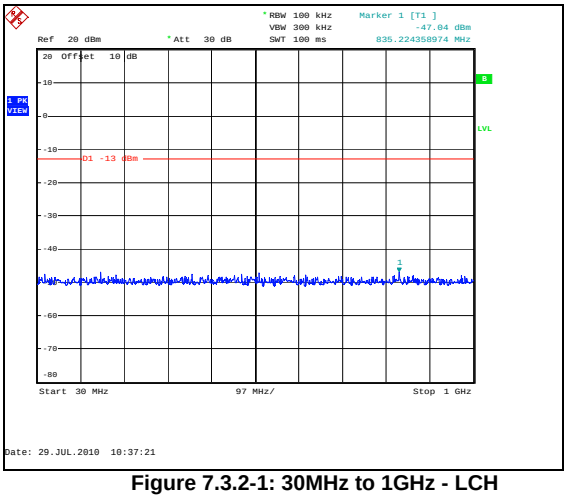

Figure 7.3.2-1: 30MHz to 1GHz - LCH

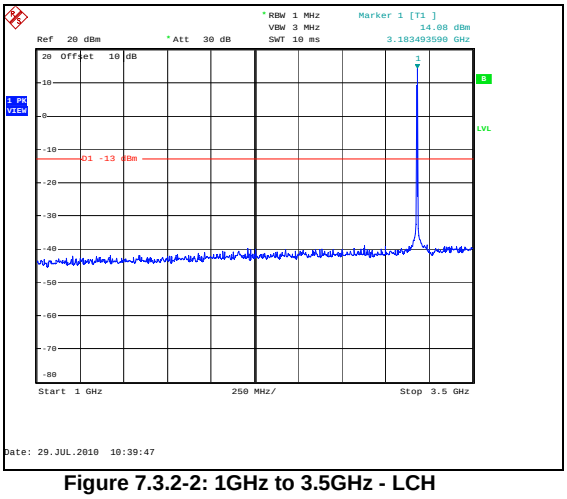

Figure 7.3.2-2: 1GHz to 3.5GHz - LCH

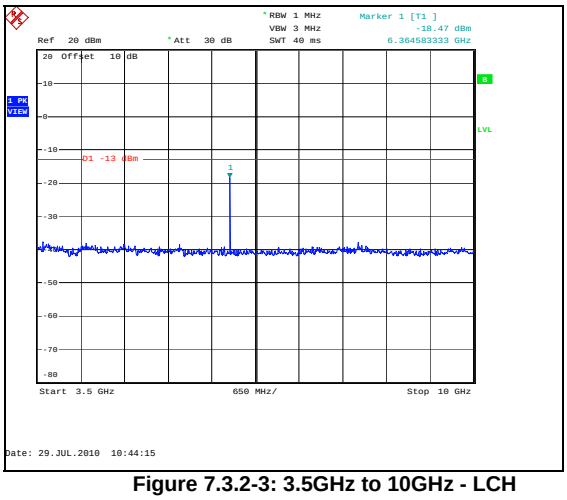

Figure 7.3.2-3: 3.5GHz to 10GHz - LCH

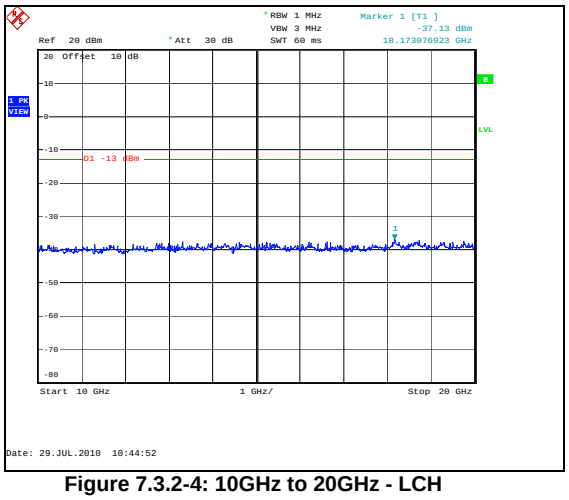

Figure 7.3.2-4: 10GHz to 20GHz - LCH

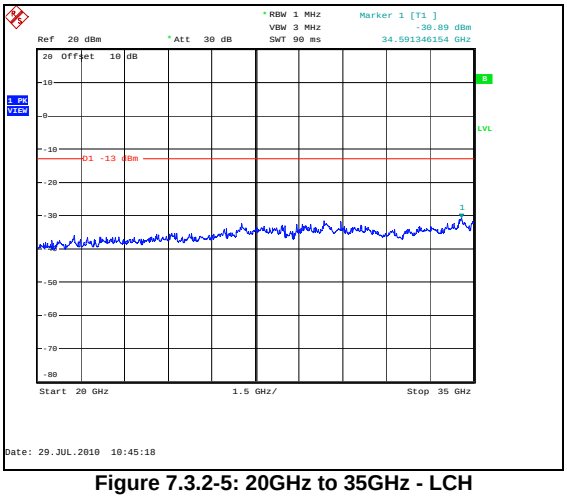

Figure 7.3.2-5: 20GHz to 35GHz - LCH

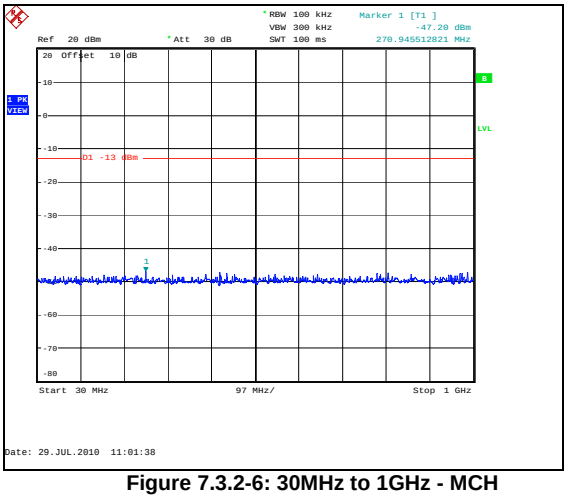

Figure 7.3.2-6: 30MHz to 1GHz - MCH

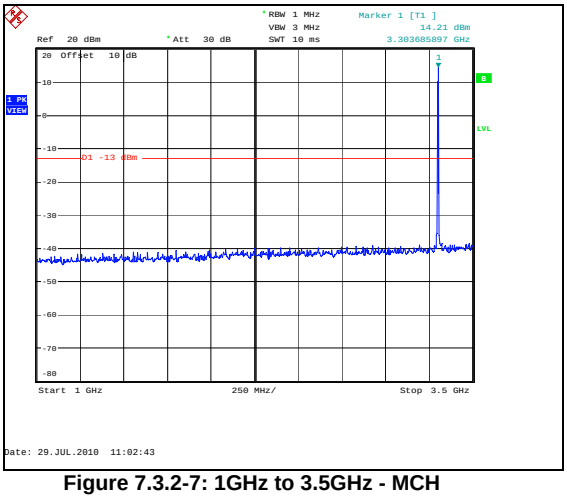

Figure 7.3.2-7: 1GHz to 3.5GHz - MCH

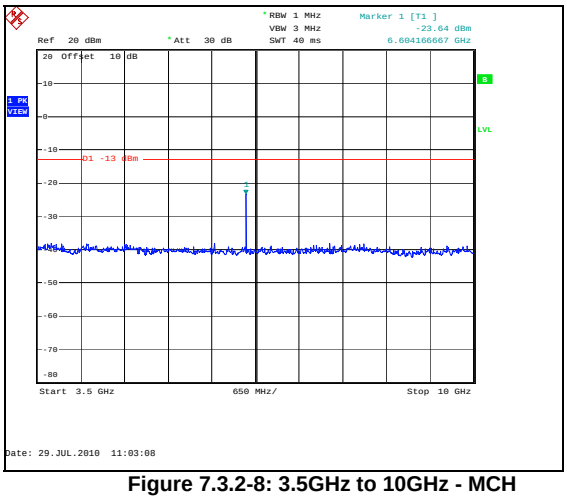

Figure 7.3.2-8: 3.5GHz to 10GHz - MCH

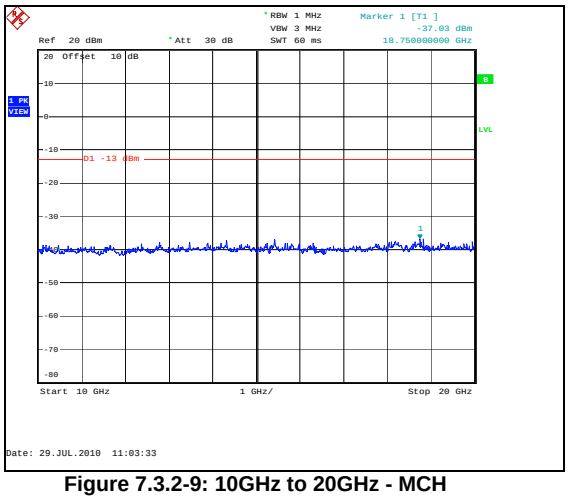

Figure 7.3.2-9: 10GHz to 20GHz - MCH

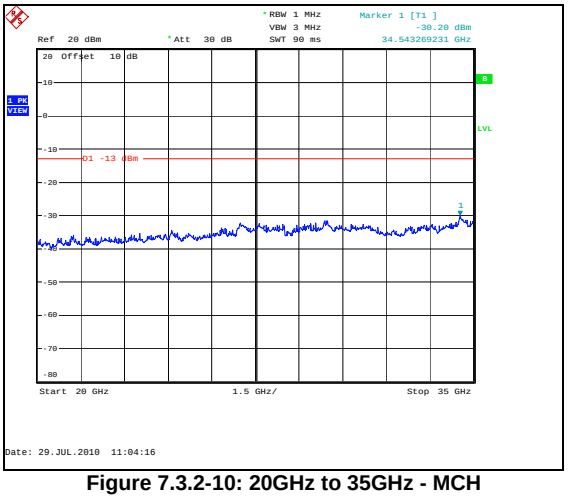

Figure 7.3.2-10: 20GHz to 35GHz - MCH

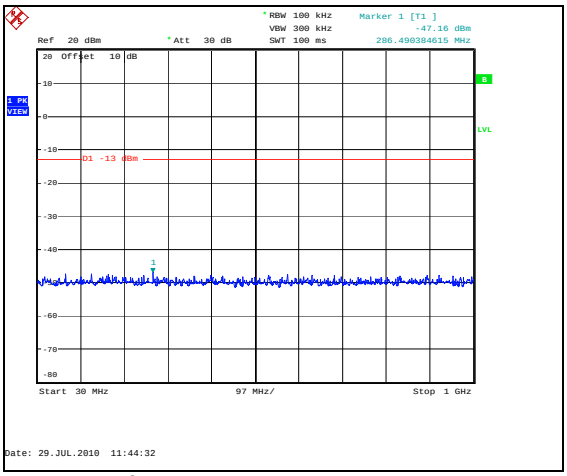

Figure 7.3.2-11: 30MHz to 1GHz - HCH

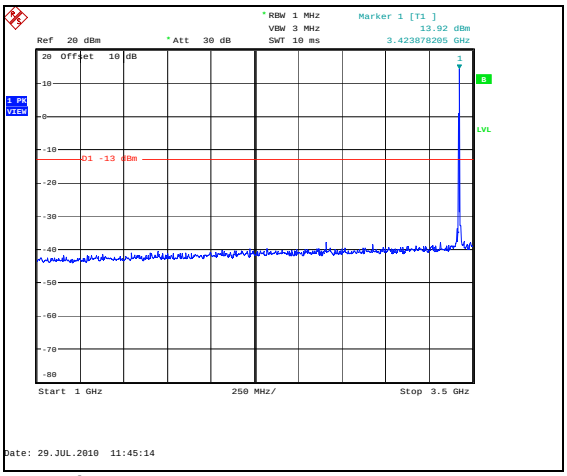

Figure 7.3.2-12: 1GHz to 3.5GHz - HCH

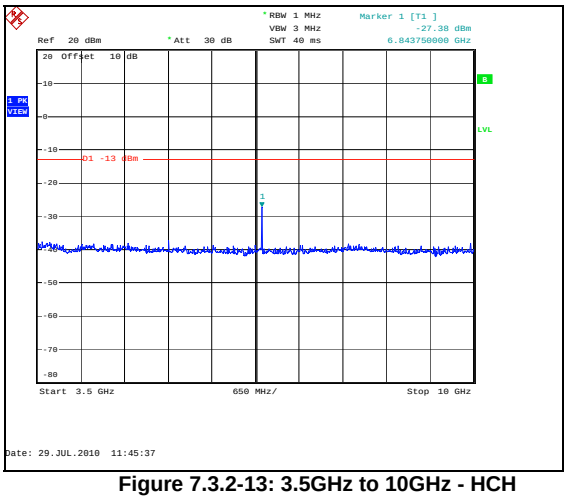

Figure 7.3.2-13: 3.5GHz to 10GHz - HCH

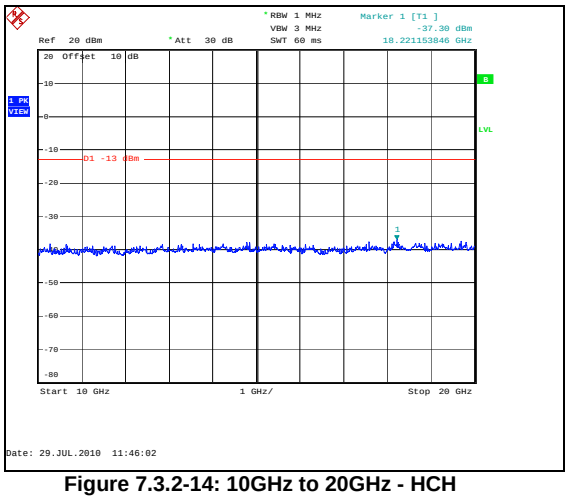

Figure 7.3.2-14: 10GHz to 20GHz - HCH

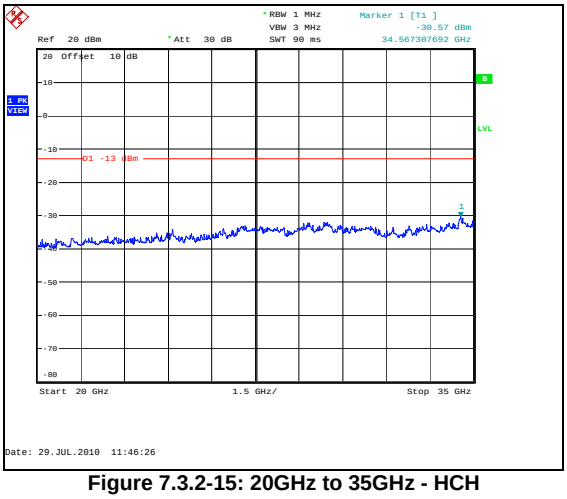

Figure 7.3.2-15: 20GHz to 35GHz - HCH

7.4 Field Strength of Spurious Emissions

7.4.1 Measurement Procedure

The equipment under test is placed in the Semi-Anechoic Chamber (described in section 2.3.1) on a wooden 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 360º and the maximum reading on the spectrum analyzer is recorded. This was repeated for both horizontal and vertical polarizations of the receive antenna.

For measurements below 18 GHz 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. For measurements above 18 GHz field strength measurements were performed and converted to ERP.

The spectrum was investigated in accordance to CFR 47 Part 2.1057.

Results of the test are shown below. 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.

7.4.2 Measurement Results

Table 7.4.2-1: Field Strength of Spurious Emissions – LCH

Frequency (MHz)	ERP (dBm)	Antenna Polarity (H/V)	Limit (dBm)	Margin (dB)
6360	-19.04	H	-13.00	6.04
6360	-20.14	V	-13.00	7.14
9540	-40.22	H	-13.00	27.22
12720	-36.94	H	-13.00	23.94
15900	-39.31	H	-13.00	26.31
15900	-42.91	V	-13.00	29.91
19080	-41.48	H	-13.00	28.48
19080	-42.41	V	-13.00	29.41
22260	-41.03	H	-13.00	28.03
22260	-45.17	V	-13.00	32.17
28620	-54.48	H	-13.00	41.48
28620	-56.55	V	-13.00	43.55
31800	-56.81	H	-13.00	43.81
31800	-55.06	V	-13.00	42.06

Table 7.4.2-2: Field Strength of Spurious Emissions – MCH

Frequency (MHz)	ERP (dBm)	Antenna Polarity (H/V)	Limit (dBm)	Margin (dB)
6600	-21.52	H	-13.00	8.52
6600	-23.82	V	-13.00	10.82
9900	-40.44	H	-13.00	27.44
9900	-41.74	V	-13.00	28.74
16500	-37.06	H	-13.00	24.06
16500	-37.56	V	-13.00	24.56
19800	-32.77	H	-13.00	19.77
19800	-36.75	V	-13.00	23.75
23100	-40.72	H	-13.00	27.72
23100	-41.17	V	-13.00	28.17
29700	-51.87	H	-13.00	38.87
29700	-54.29	V	-13.00	41.29
33000	-55.40	H	-13.00	42.40
33000	-56.14	V	-13.00	43.14

Table 7.4.2-3: Field Strength of Spurious Emissions – HCH

Frequency (MHz)	ERP (dBm)	Antenna Polarity (H/V)	Limit (dBm)	Margin (dB)
6840	-27.02	H	-13.00	14.02
6840	-28.22	V	-13.00	15.22
10260	-35.42	H	-13.00	22.42
10260	-42.02	V	-13.00	29.02
17100	-38.73	H	-13.00	25.73
20520	-25.61	H	-13.00	12.61
20520	-31.79	V	-13.00	18.79
23940	-38.23	H	-13.00	25.23
23940	-40.81	V	-13.00	27.81
27360	-46.64	H	-13.00	33.64
27360	-50.38	V	-13.00	37.38
34200	-52.90	H	-13.00	39.90

7.5 Frequency Stability

7.5.1 Measurement Procedure

The equipment under test is placed inside an environmental chamber. The RF output is directly coupled to the input of the measurement equipment via a 10 dB attenuator and a power supply is attached to the primary supply voltage.

Frequency measurements were made at the extremes of the of temperature range -30º C to +50º C and at intervals of 10º C at normal supply voltage. A period of time sufficient to stabilize all components of the equipment was allowed at each frequency measurement. At a temperature 20º C the supply voltage was varied to battery operating end-point. The maximum variation of frequency was recorded.

7.5.2 Measurement Results

Frequency Stability

Frequency (MHz): 3180
Deviation Limit (PPM): 350ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**3180.000319**	**0.100**	100%	6.00
-20 C	**3179.998567**	**-0.451**	100%	6.00
-10 C	**3179.998255**	**-0.549**	100%	6.00
0 C	**3179.997460**	**-0.799**	100%	6.00
10 C	**3179.996943**	**-0.961**	100%	6.00
20 C	**3179.996580**	**-1.075**	100%	6.00
30 C	**3179.996526**	**-1.092**	100%	6.00
40 C	**3179.995904**	**-1.288**	100%	6.00
50 C	**3179.995499**	**-1.415**	100%	6.00
20 C	**3179.996405**	**-1.131**	endpoint	4.700

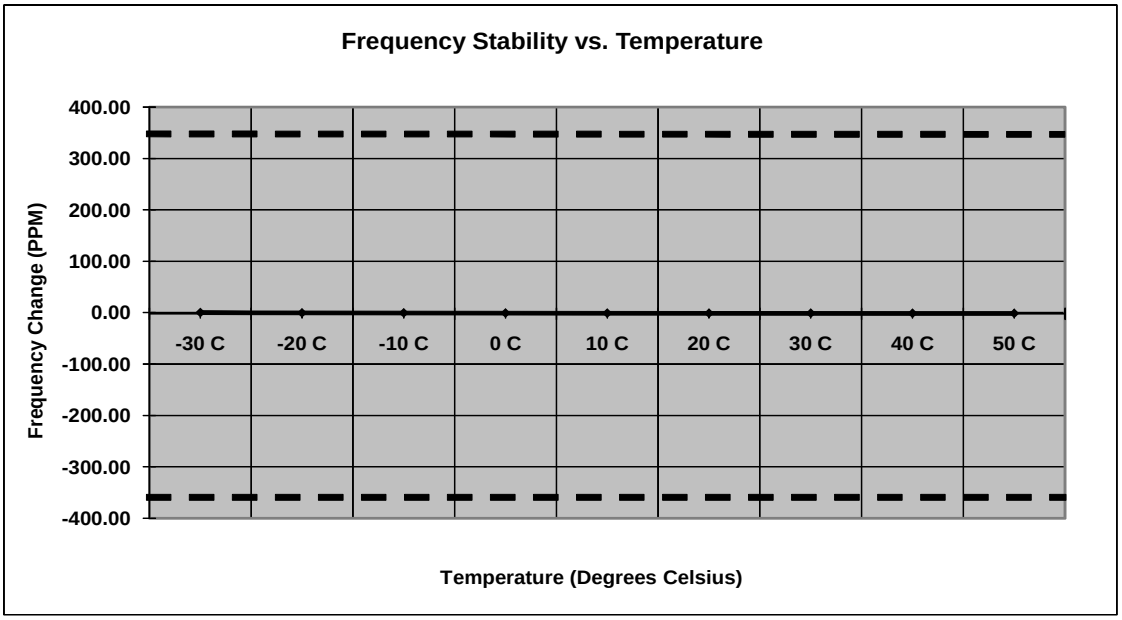

Figure 7.5.2-1: Frequency Stability – Low Channel

Frequency Stability

Frequency (MHz): 3300
Deviation Limit (PPM): 350ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**3300.000207**	**0.063**	100%	6.00
-20 C	**3299.998492**	**-0.457**	100%	6.00
-10 C	**3299.998207**	**-0.543**	100%	6.00
0 C	**3299.997318**	**-0.813**	100%	6.00
10 C	**3299.996819**	**-0.964**	100%	6.00
20 C	**3299.996258**	**-1.134**	100%	6.00
30 C	**3299.996324**	**-1.114**	100%	6.00
40 C	**3299.995703**	**-1.302**	100%	6.00
50 C	**3299.995316**	**-1.419**	100%	6.00
20 C	**3299.996267**	**-1.131**	endpoint	4.700

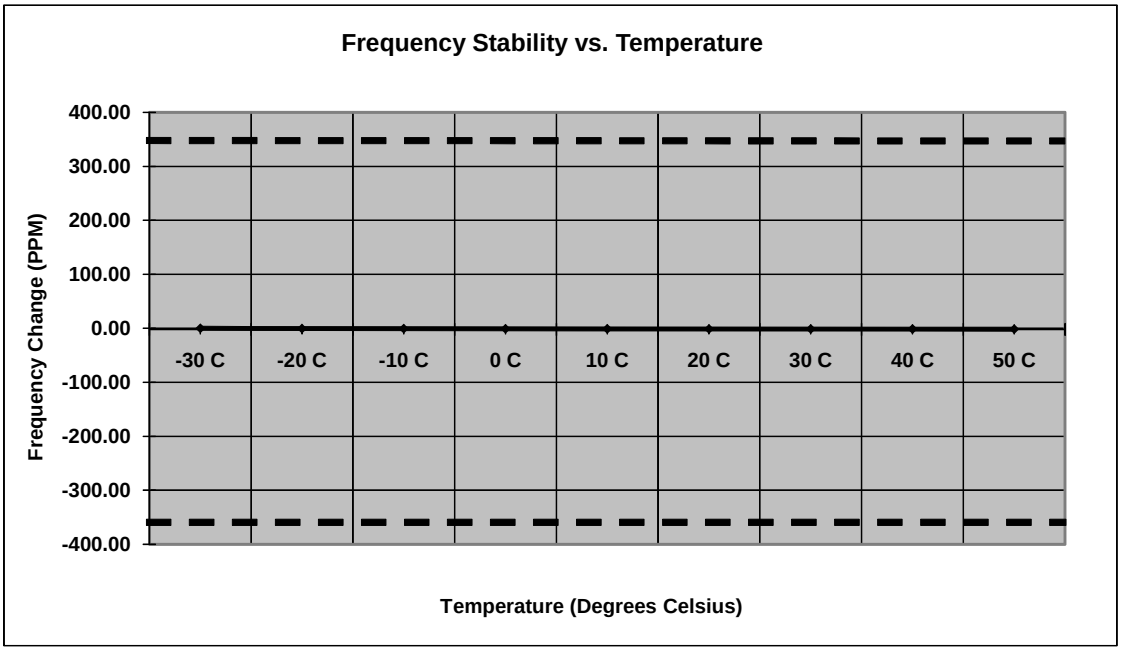

Figure 7.5.2-2: Frequency Stability – Mid Channel

Frequency Stability

Frequency (MHz): 3420
Deviation Limit (PPM): 350ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**3420.000252**	**0.074**	100%	6.00
-20 C	**3419.998454**	**-0.452**	100%	6.00
-10 C	**3419.998130**	**-0.547**	100%	6.00
0 C	**3419.997197**	**-0.820**	100%	6.00
10 C	**3419.996723**	**-0.958**	100%	6.00
20 C	**3419.996114**	**-1.136**	100%	6.00
30 C	**3419.996168**	**-1.120**	100%	6.00
40 C	**3419.995516**	**-1.311**	100%	6.00
50 C	**3419.995137**	**-1.422**	100%	6.00
20 C	**3419.996152**	**-1.125**	endpoint	4.700

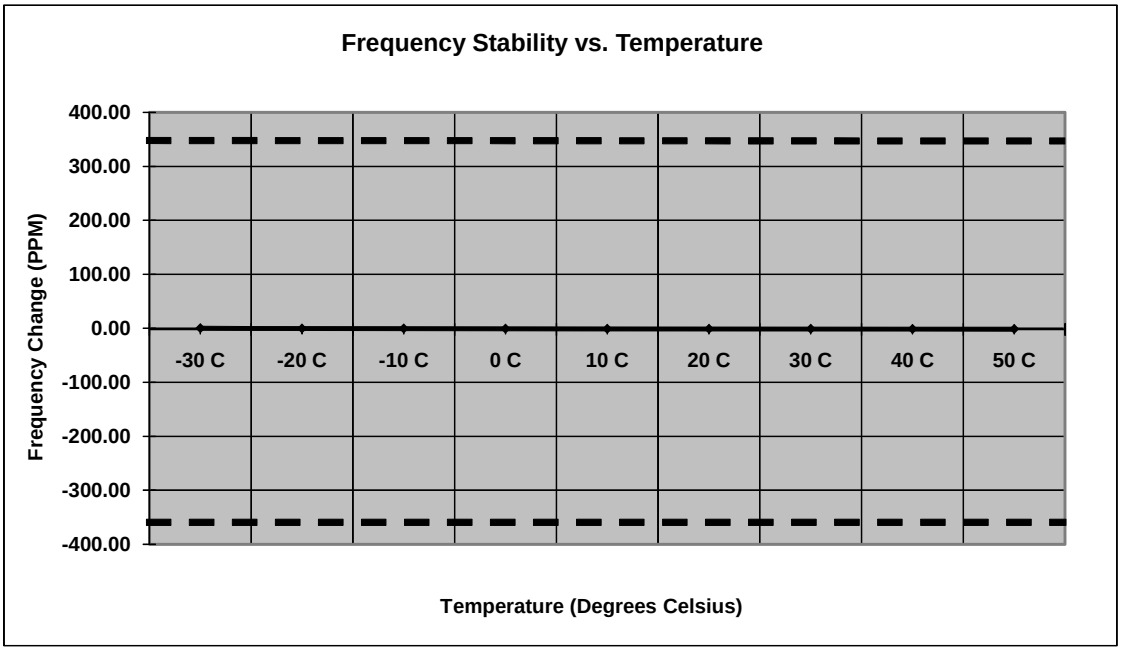

Figure 7.5.2-3: Frequency Stability – High Channel

8 CONCLUSION

In the opinion of ACS, Inc. the model RANGE-R, manufactured by L-3 Communications CyTerra meets all the requirements of FCC Part 90 and DA 09-2482 as applicable.

End Report