Excellence in Compliance Testing

Certification Test Report

FCC ID: YKD-25STW4100-019

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

ACS Report Number: 13-2037.W03.1A

Applicant: L-3 Communications CyTerra Corporation
Model: Range-R 2D

Test Begin Date: March 26, 2013
Test End Date: September 4, 2013

Report Issue Date: September 4, 2013

For The Scope of Accreditation Under Certificate Number AT-1533

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 ACLASS, NVLAP, ANSI, or any agency of the Federal Government.

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This report contains 29 pages

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1.0 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 L-3 CyTerra RANGE-R 2D is a stepped-frequency continuous-wave (SFCW), handheld radar for motion detection of human targets. 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 unit is powered with 12 VDC using eight (8) "AA" batteries.

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

Test Sample Serial Numbers: 00076

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

1.3 Test Methodology

1.3.1 Configurations and Justification

The Range-R 2D was evaluated with the stepped-frequency function disabled. Measurements were performed at the low, middle and high channels. The internal RF power output attenuation setting of the EUT was set to 3.5dB for all the measurements.

The EUT was assessed for radiated emissions in the orientation of typical utilization. The unit was battery powered and was investigated up to the 10^{th} harmonic.

For the RF conducted measurements, the unit was powered using an external power supply operating at 12 VDC.

The unit was also evaluated for unintentional emissions. The results are documented separately in a verification report.

1.4 Emission Designators

The Range-R 2D is a stepped-frequency continuous-wave transmitter (SFCW). The emissions designator is N0N.

2.0 TEST FACILITIES

2.1 Location

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

Site 1
Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

Site 2
Advanced Compliance Solutions, Inc.
5015 B.U. Bowman Drive
Buford GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598
www.acstestlab.com

2.2 Laboratory Accreditations/Recognitions/Certifications

Site 1
ACS, Boca Raton, Florida, is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation.

Site 2
ACS, Buford, GA is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP).

Unless otherwise specified, all test methods described within this report are covered under the respective test site ISO/IEC 17025 scope of accreditation.

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 floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with metallic loaded springs. An EMCO Model 1051 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:

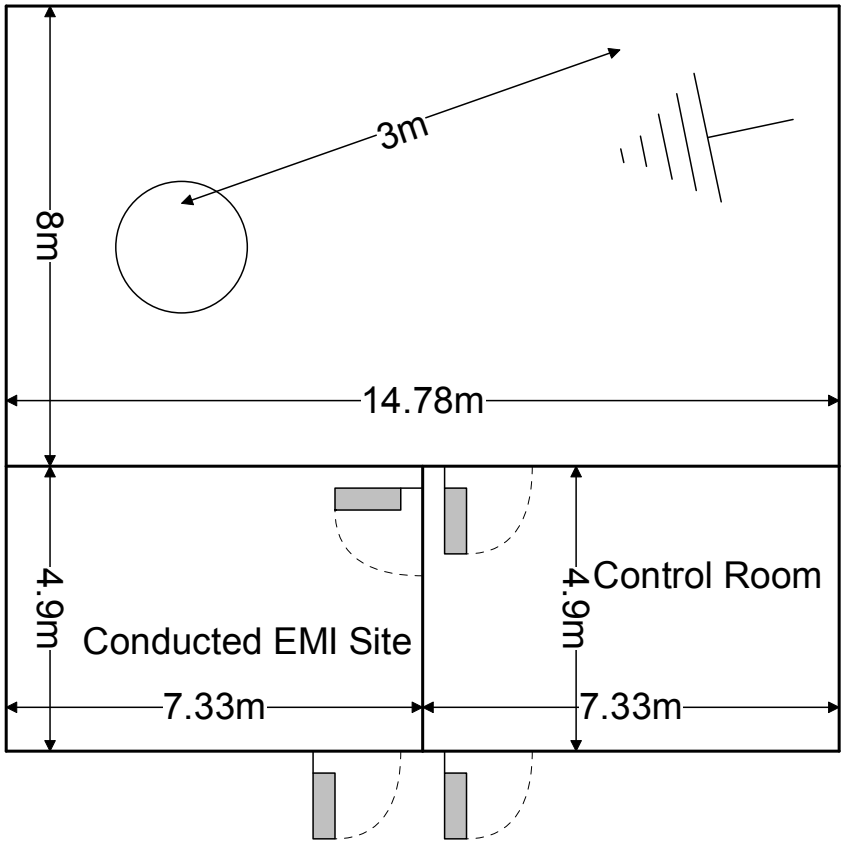

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

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

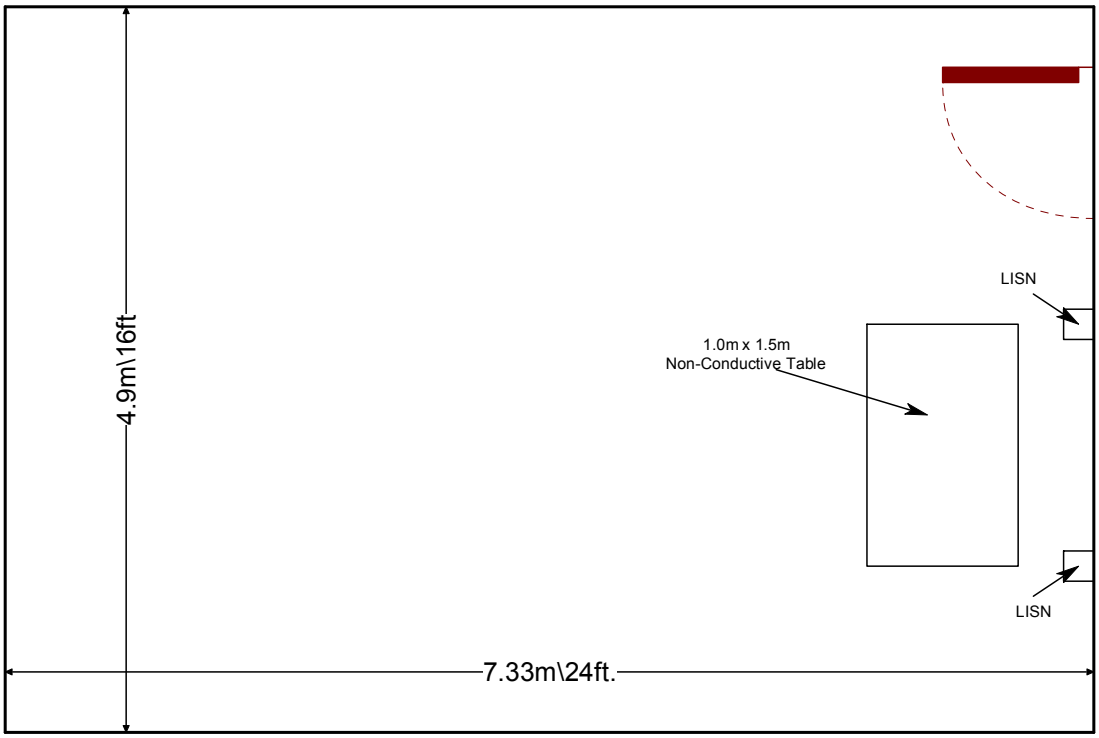

Figure 2.3.2-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

1 - ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 35GHz - 2003
2 - US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2013
3 - US Code of Federal Regulations (CFR): Title 47, Part 90: Private Land Mobile Services – 2013
4 – TIA-603-D: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2010

4.0 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

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/1/2012	8/1/2013
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	7/30/2013	7/30/2015
315	Sorensen	QRD 20-4	Power Supplies	2716	NCR	NCR
332	Rohde & Schwarz	TS-PR40	Amplifiers	100021	2/2/2012	2/2/2014
333	Rohde&Schwarz	3160-10	Antennas	45576	11/4/2010	NCR
335	Suhner	SF-102A	Cables	882/2A	8/2/2012	8/2/2013
335	Suhner	SF-102A	Cables	882/2A	7/29/2013	7/29/2014
339	Aeroflex/Weinschel	AS-18	Attenuators	7142	6/4/2012	7/2/2013
339	Aeroflex/Weinschel	AS-18	Attenuators	7142	6/19/2013	6/19/2014
341	Aeroflex/Weinschel	54A-20	Attenuators	4686	8/2/2012	8/2/2013
341	Aeroflex/Weinschel	54A-20	Attenuators	4686	7/29/2013	7/29/2014
345	Suhner Sucoflex	102A	Cables	1077/2A	8/2/2012	8/2/2013
345	Suhner Sucoflex	102A	Cables	1077/2A	7/29/2013	7/29/2014
426	Thermotron	S-8 Mini Max	Environmental Chamber	25-2888-10	8/2/2012	8/2/2013
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
524	Chase	CBL6111	Antennas	1138	1/7/2013	1/7/2015
562	United Microwave Products, Inc.	AA-190-00.48.0	Cables	562	7/31/2012	7/31/2013
562	United Microwave Products, Inc.	AA-190-00.48.0	Cables	562	7/24/2013	7/24/2014
2006	EMCO	3115	Antennas	2573	3/7/2011	4/24/2013
2006	EMCO	3115	Antennas	2573	4/24/2013	4/24/2015
2007	EMCO	3115	Antennas	2419	1/18/2012	1/18/2014
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2012	12/31/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/1/2013	1/1/2014
2071	Trilithic, Inc.	4HC1400-1-KK	Filter	9643263	12/31/2012	12/31/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	12/31/2012	12/31/2013
2078	ACS Boca	Substitution Cable Set	Cable Set	2078	1/1/2013	1/1/2014
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2012	5/31/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2013	5/31/2014
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/20/2012	12/20/2013
2091	Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
2096	Alpha Wire	9055B	Cables	2096	6/29/2012	6/29/2013
2096	Alpha Wire	9055B	Cables	2096	7/2/2013	7/2/2014
2099	Agilent Technologies	11970A	Mixer	2332A02313	11/27/2012	11/27/2013
2101	Mini Circuits	VHF-6010+	Filter	2101	3/26/2013	3/26/2014

Notes:

- **NCR=No Calibration Required**
- **Asset 2101 is a new asset that was acquired during the test cycle.**
- **Assets 426 and 2096 were utilized during the active calibration cycle.**
- **The information for Assets 283, 335, 339, 341, 345, 562, 2006, 2082 is provided to cover the entire test cycle.**

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	DC Power Supply	MPJA	HY5003	003700278

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Power Cable	1.1m	No	EUT to Power Supply
B	Power Cord	1.83m	No	DC Power Supply to AC Mains

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

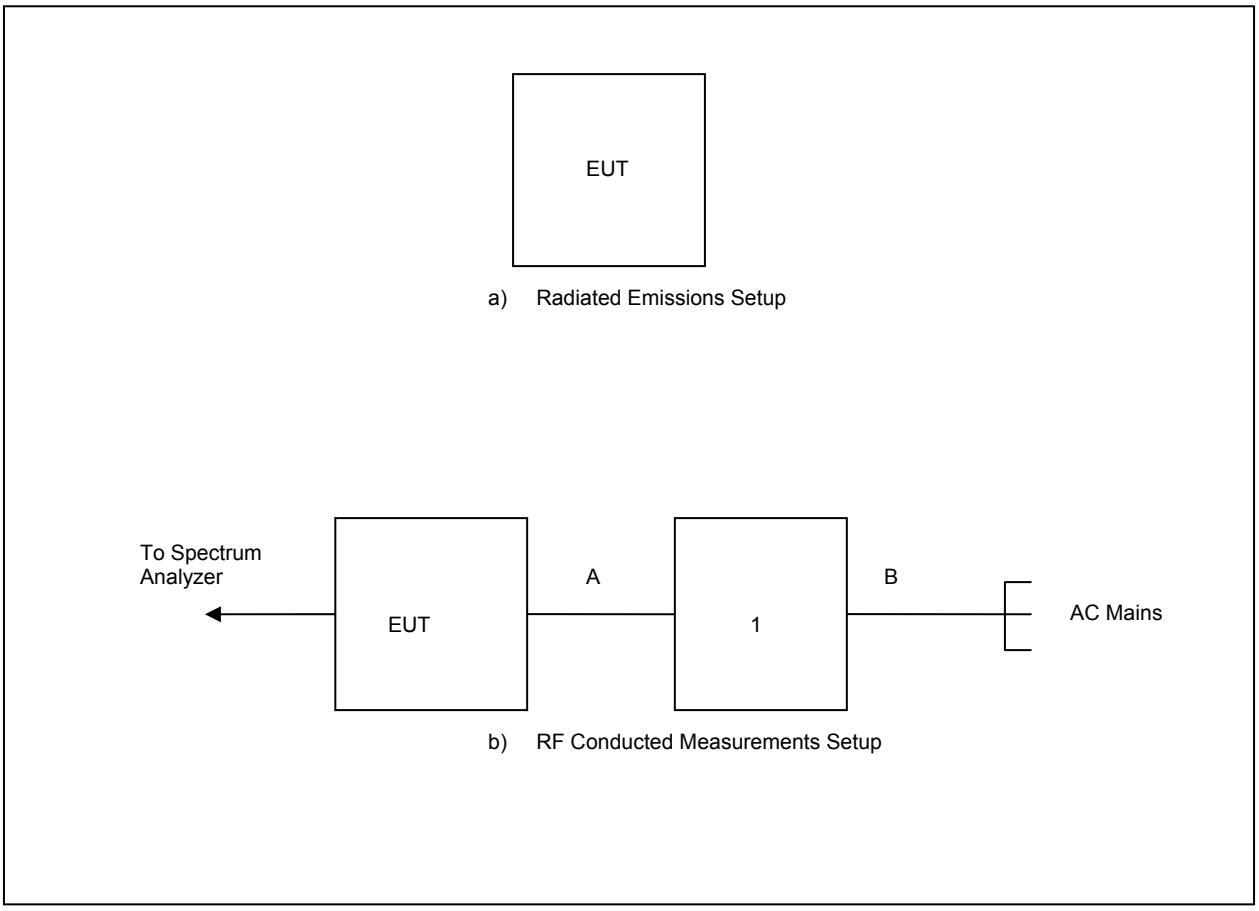

Figure 6-1: EUT Test Setup

7.0 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 Site	Test Summary
RF Power Output	1	Pass
Occupied Bandwidth (Emissions Limits)	1	Pass
Spurious Emissions at Antenna Terminals	1	Pass
Field Strength of Spurious Emissions	1	Pass
Frequency Stability	2	Pass

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 Spectrum Analyzer through a 20 dB passive attenuator. The resolution and video bandwidths of the spectrum analyzer were set at sufficient levels, >> signal bandwidth, to produce accurate results. The internal correction factors of the spectrum analyzer 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)
3101	14.79
3299	14.61
3499	14.66

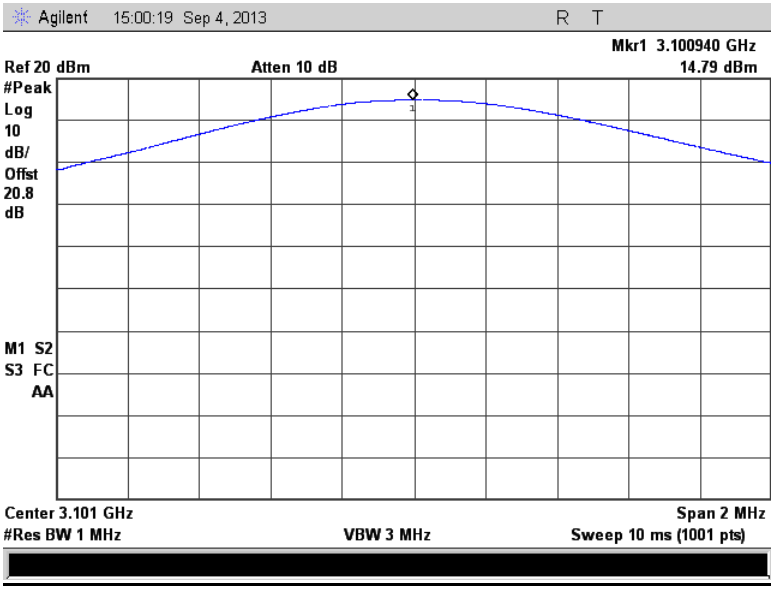

Figure 7.1.2-1: Peak Output Power – Low Channel

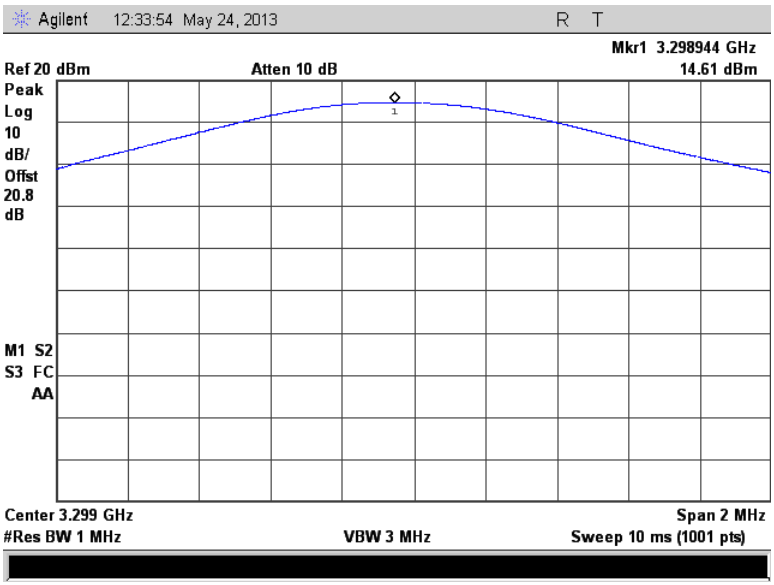

Figure 7.1.2-2: Peak Output Power – Middle Channel

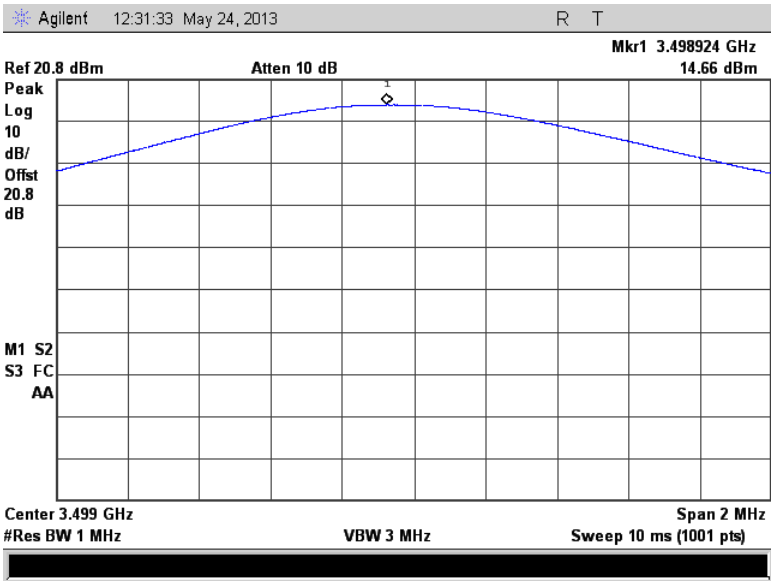

Figure 7.1.2-3: Peak Output Power – High Channel

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7.2 Occupied Bandwidth (Emission Limits)

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 20 dB passive attenuator. The spectrum analyzer resolution and video bandwidths were set to 10 Hz and 100 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 the in-band emission limitations.

7.2.2 Measurement Results

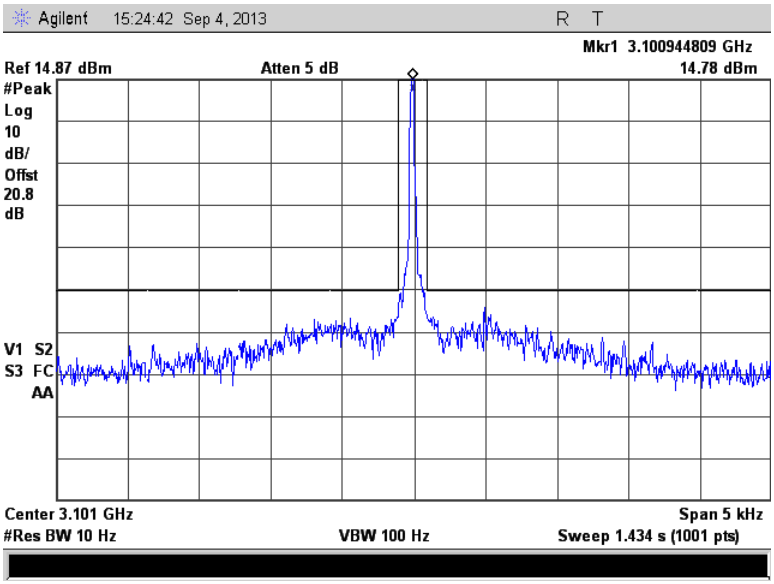

Figure 7.2.2-1: Emissions Mask – Narrow Span – Low Channel

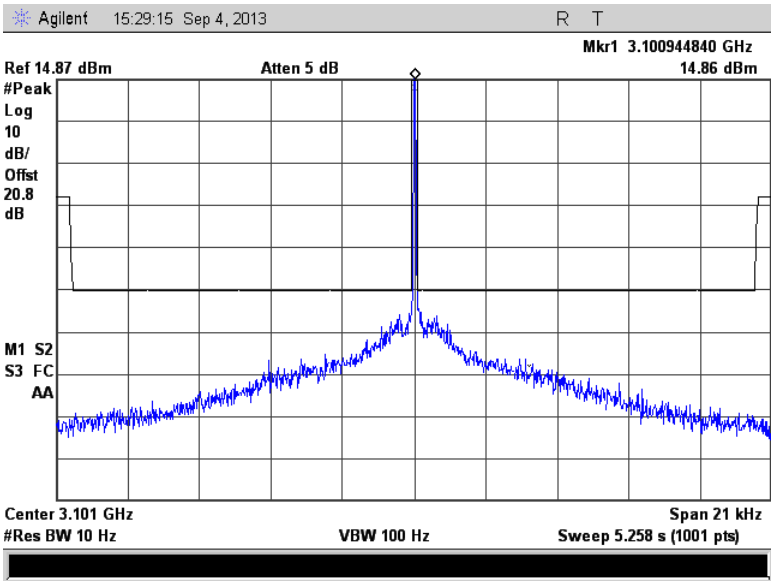

Figure 7.2.2-2: Emissions Mask – Wide Span – Low Channel

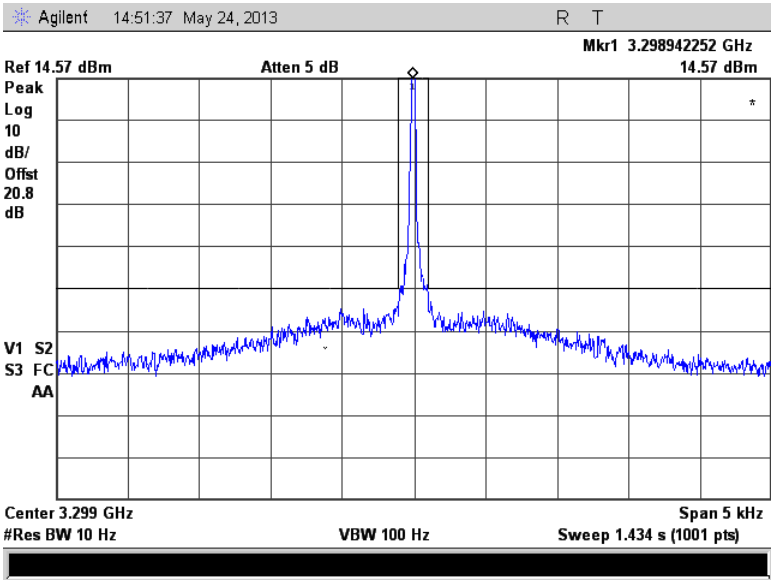

Figure 7.2.2-3: Emissions Mask – Narrow Span – Middle Channel

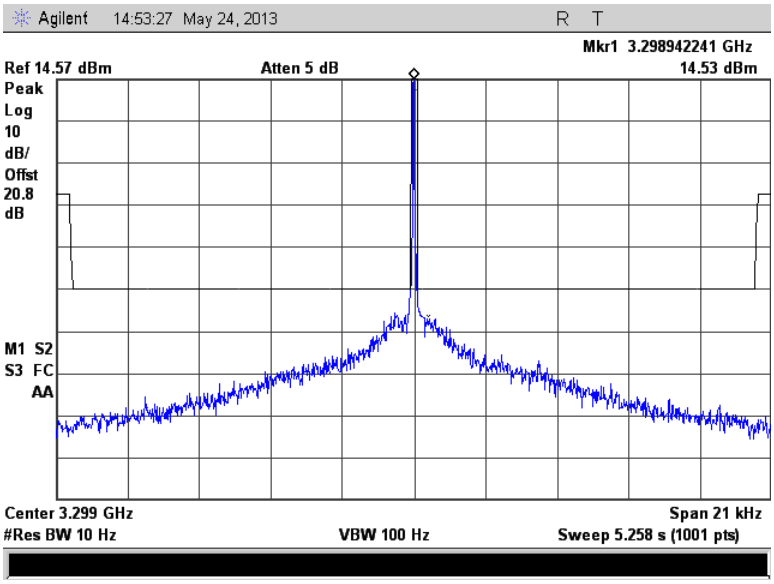

Figure 7.2.2-4: Emissions Mask – Wide Span – Middle Channel

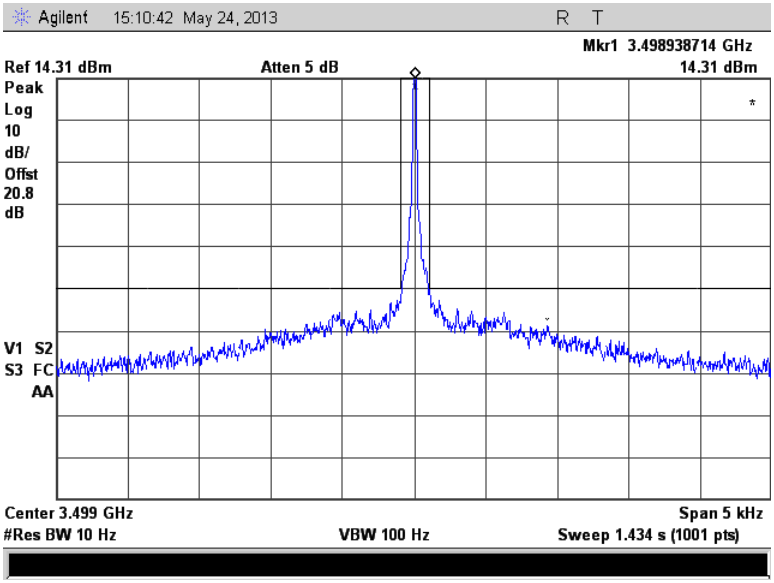

Figure 7.2.2-5: Emissions Mask – Narrow Span – High Channel

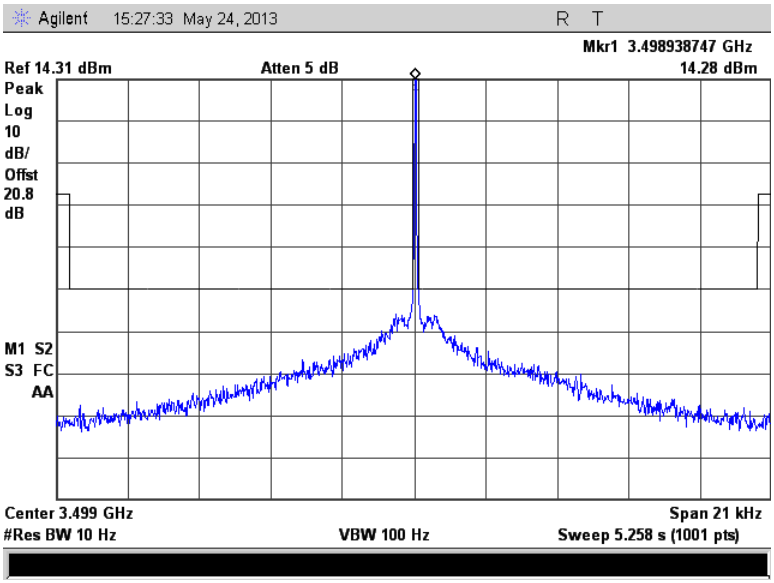

Figure 7.2.2-6: Emissions Mask – Wide Span – High Channel

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 20 dB passive attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz below 1000 MHz and 1 MHz above 1000 MHz. The internal correction factors of the spectrum analyzer were employed to correct for any cable, attenuator or filter losses. The spectrum was investigated in accordance to CFR 47 Part 2.1057. Results are shown below.

7.3.2 Measurement Results

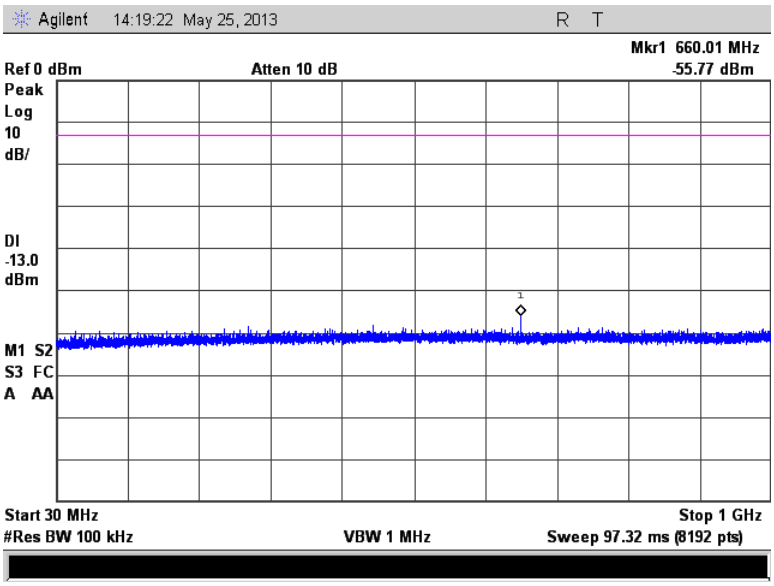

Figure 7.3.2-1: Spurious Emissions – 30MHz to 1GHz – Low Channel

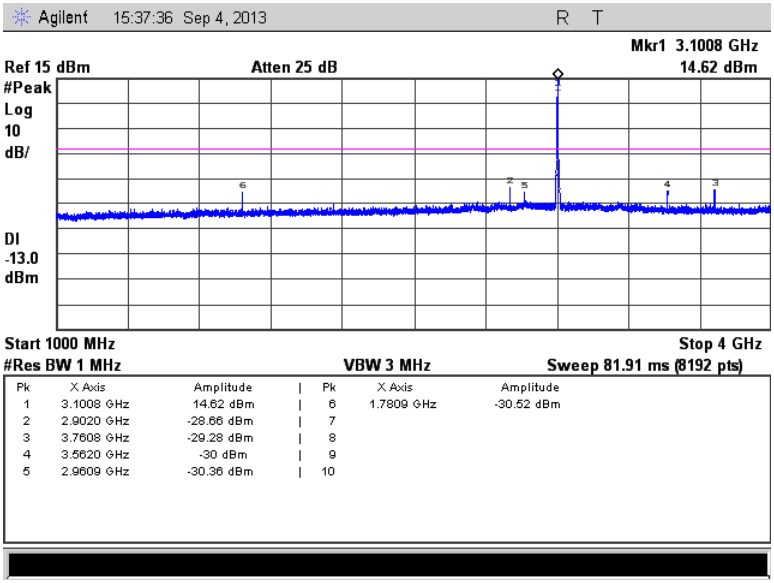

Figure 7.3.2-2: Spurious Emissions – 1GHz to 4 GHz – Low Channel

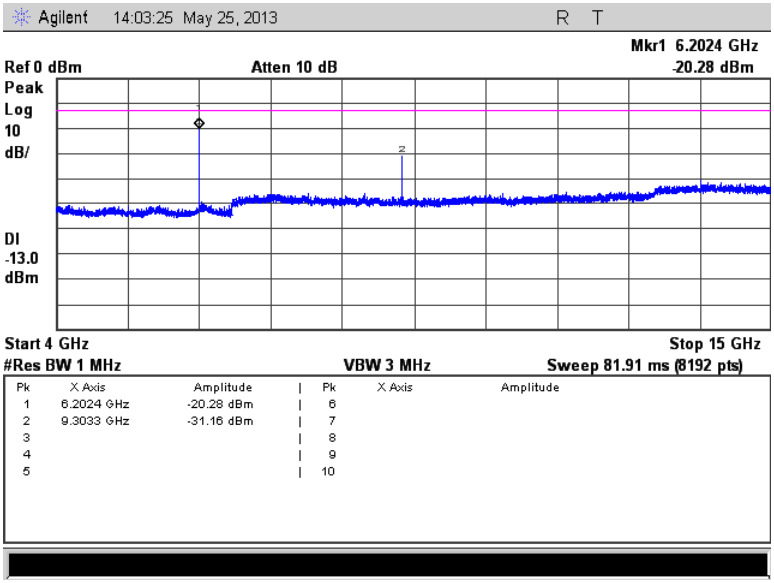

Figure 7.3.2-3: Spurious Emissions – 4 GHz to 15 GHz – Low Channel

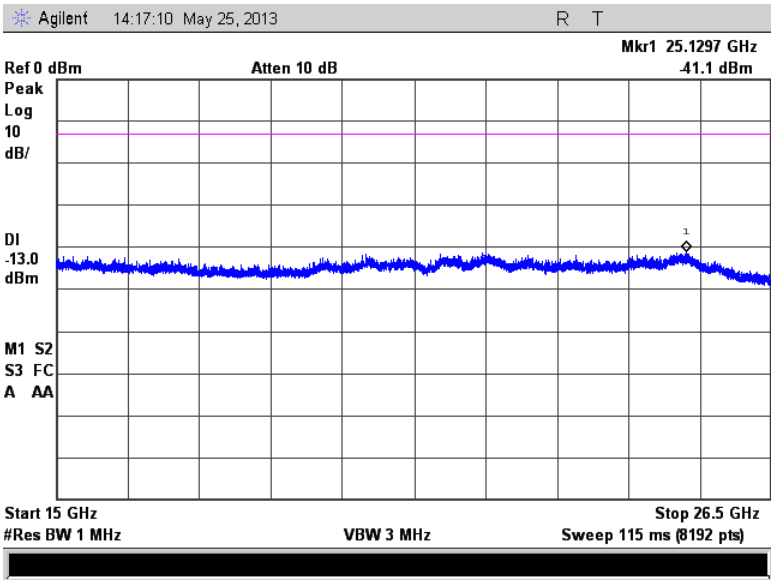

Figure 7.3.2-4: Spurious Emissions – 15 GHz to 26.5GHz – Low Channel

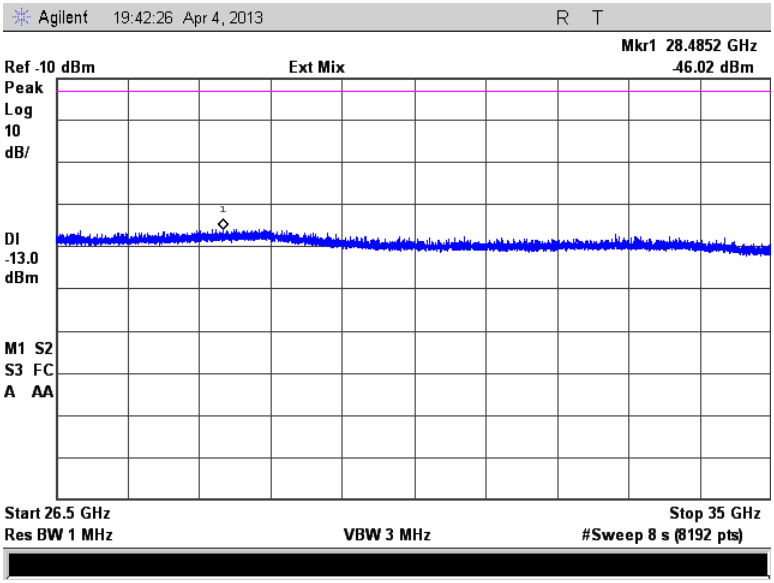

Figure 7.3.2-5: Spurious Emissions – 26.5GHz to 35 GHz – Low Channel

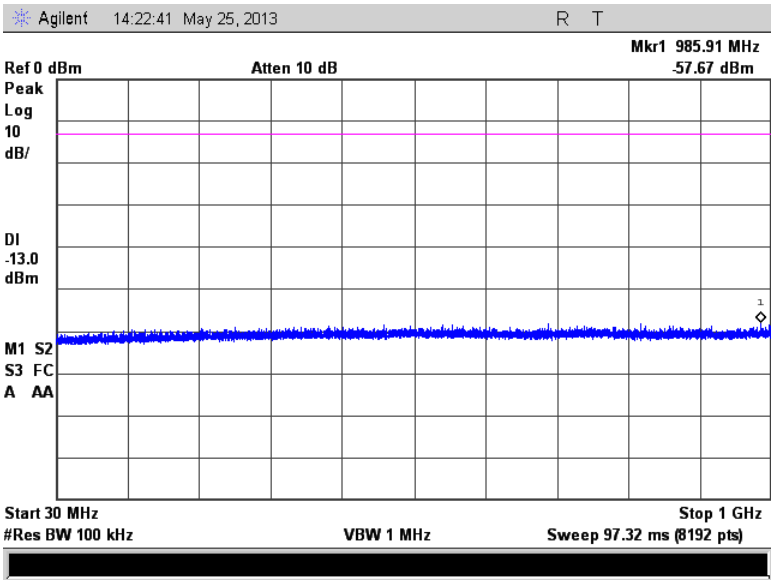

Figure 7.3.2-6: Spurious Emissions – 30MHz to 1GHz – Middle Channel

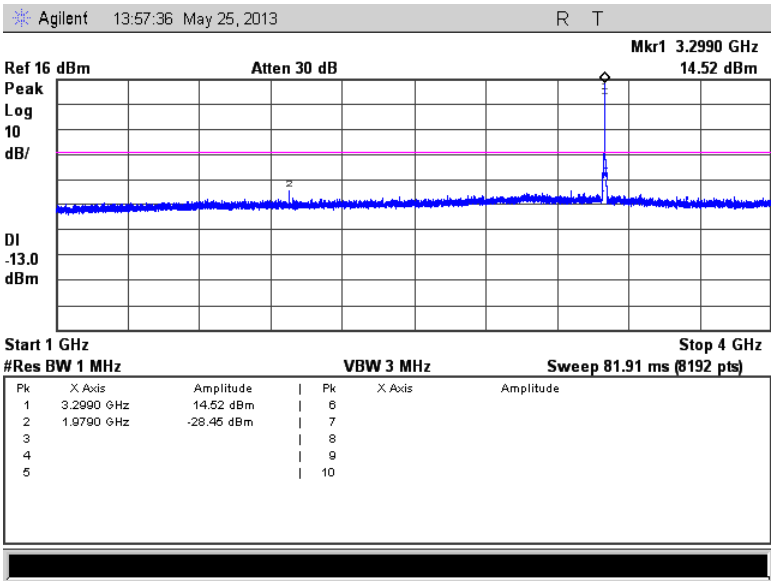

Figure 7.3.2-7: Spurious Emissions – 1GHz to 4 GHz – Middle Channel

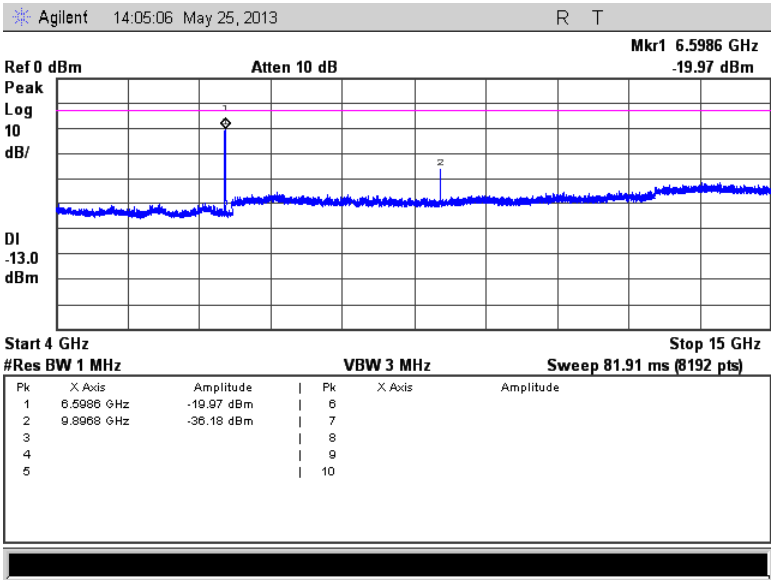

Figure 7.3.2-8: Spurious Emissions – 4GHz to 15GHz – Middle Channel

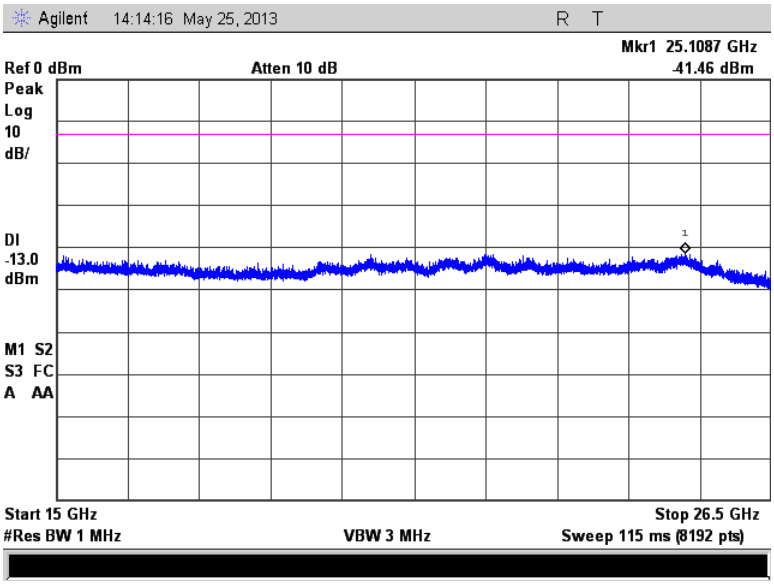

Figure 7.3.2-9: Spurious Emissions – 15GHz to 26.5GHz – Middle Channel

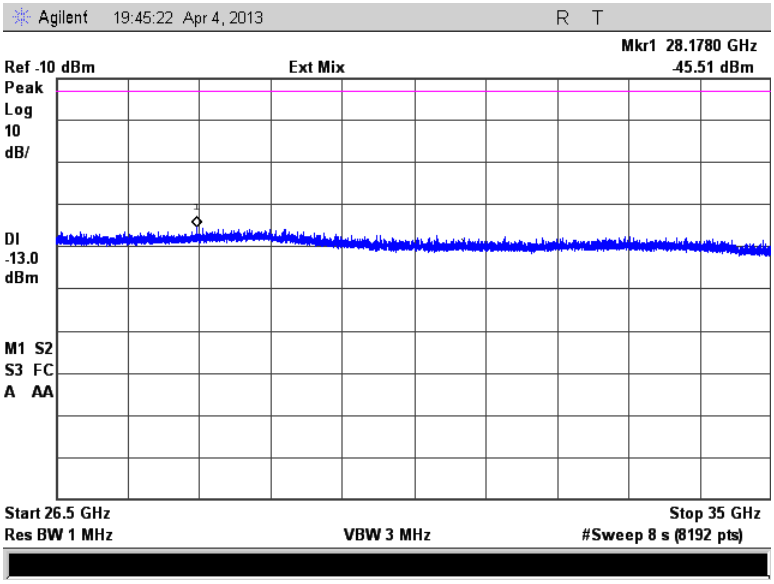

Figure 7.3.2-10: Spurious Emissions – 26.5GHz to 35GHz – Middle Channel

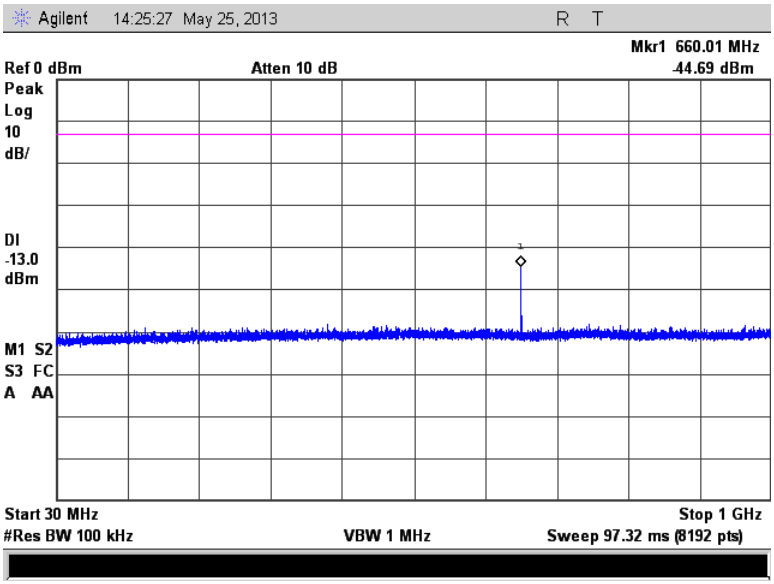

Figure 7.3.2-11: Spurious Emissions – 30MHz to 1GHz – High Channel

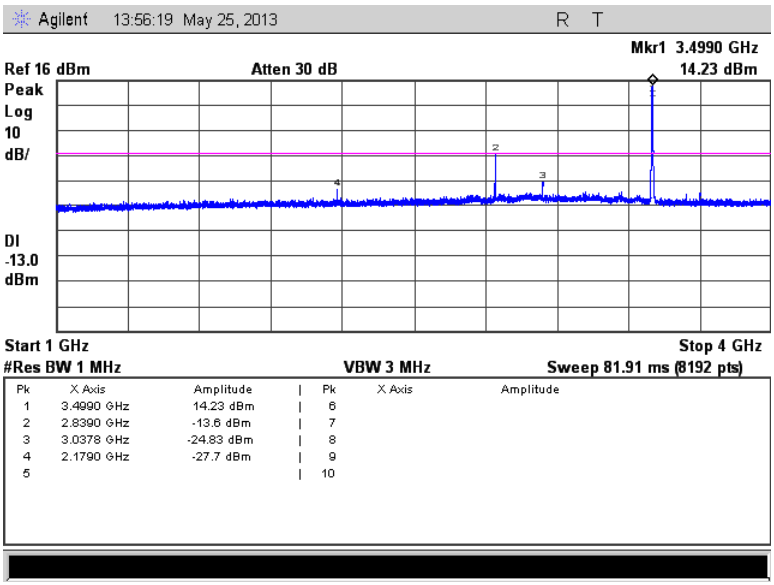

Figure 7.3.2-12: Spurious Emissions – 1GHz to 4GHz – High Channel

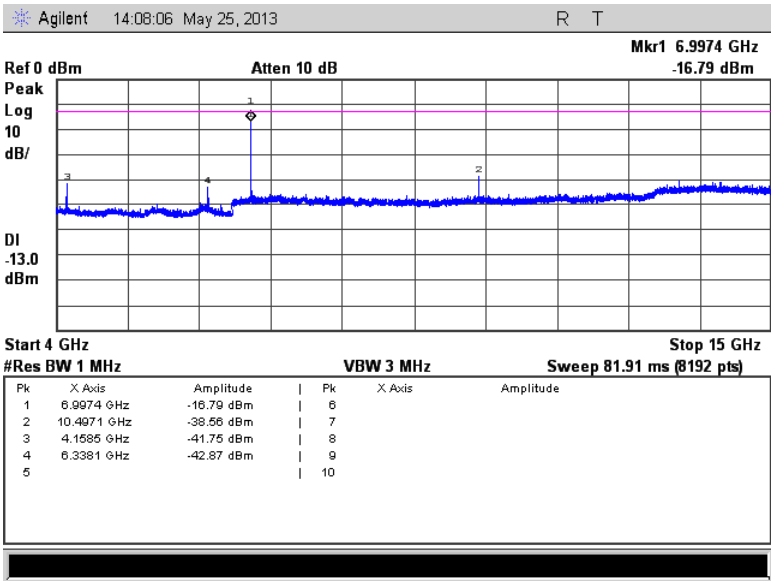

Figure 7.3.2-13: Spurious Emissions – 4GHz to 15GHz – High Channel

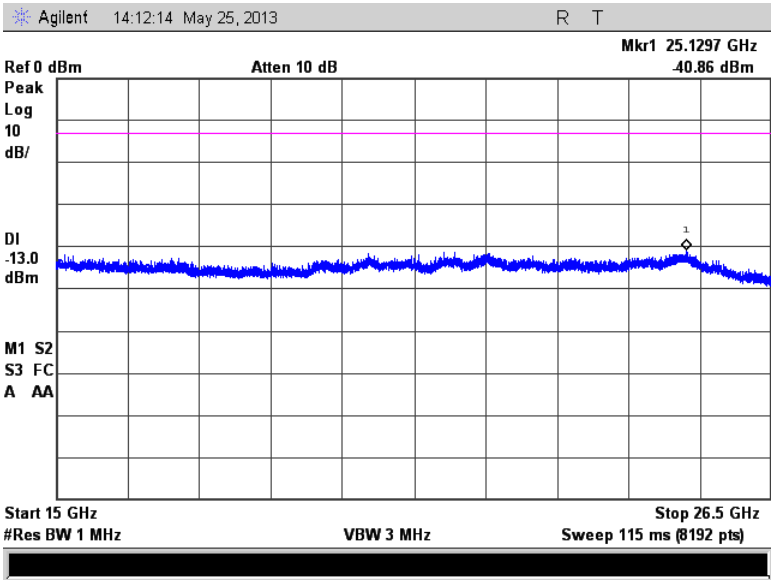

Figure 7.3.2-14: Spurious Emissions – 15GHz to 26.5GHz – High Channel

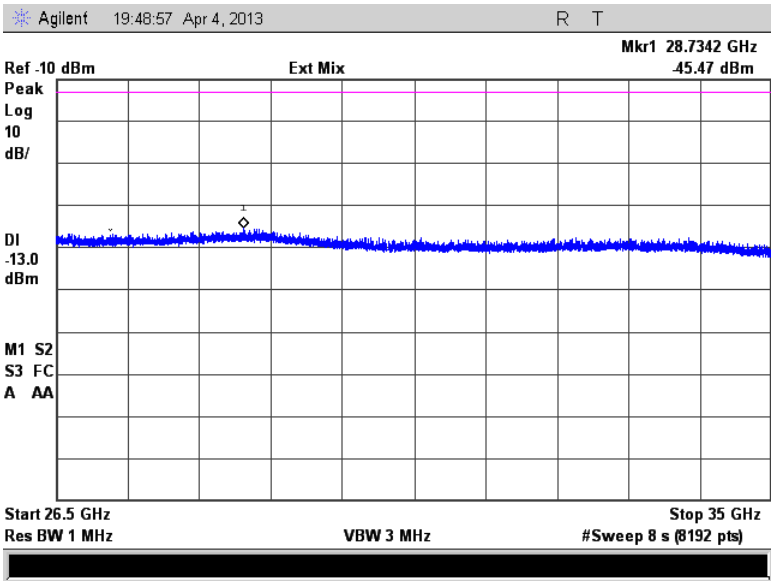

Figure 7.3.2-15: Spurious Emissions – 26.5GHz to 35GHz – High Channel

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.

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.

7.4.2 Measurement Results

Table 7.4.2-1: Field Strength of Spurious Emissions – Low Channel

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
6202	-44.95	H	-23.28	-13.00	10.28
6202	-47.05	V	-27.13	-13.00	14.13
9303	-58.05	V	-38.35	-13.00	25.35

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 7.4.2-2: Field Strength of Spurious Emissions – Middle Channel

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
6598	-46.20	H	-23.25	-13.00	10.25
6598	-46.40	V	-24.25	-13.00	11.25

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

Table 7.4.2-3: Field Strength of Spurious Emissions – High Channel

Frequency (MHz)	Spectrum Analyzer Level (dBm)	Antenna Polarity (H/V)	Spurious ERP (dBm)	Limit (dBm)	Margin (dB)
2838.9	-36.65	H	-20.16	-13.00	7.16
6998	-44.95	H	-17.60	-13.00	4.60
10497	-56.27	H	-44.08	-13.00	31.08
2838.9	-41.70	V	-24.36	-13.00	11.36
6998	-44.70	V	-18.05	-13.00	5.05
10497	-57.05	V	-46.64	-13.00	33.64

NOTE: All frequencies not listed were below the noise floor of the spectrum analyzer.

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 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 measurements were performed at the end point voltage. The maximum variation of frequency was recorded.

The results of the tests are shown below.

7.5.2 Measurement Results

Frequency Stability

Frequency (MHz): 3101

Deviation Limit (PPM): 350ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**3100.948609**	**-16.572**	100%	12.00
-20 C	**3100.948393**	**-16.642**	100%	12.00
-10 C	**3100.947483**	**-16.936**	100%	12.00
0 C	**3100.946202**	**-17.349**	100%	12.00
10 C	**3100.946557**	**-17.234**	100%	12.00
20 C	**3100.946444**	**-17.271**	100%	12.00
30 C	**3100.945612**	**-17.539**	100%	12.00
40 C	**3100.945116**	**-17.699**	100%	12.00
50 C	**3100.945067**	**-17.715**	100%	12.00
20 C	**3100.945929**	**-17.437**	Endpoint	7.00

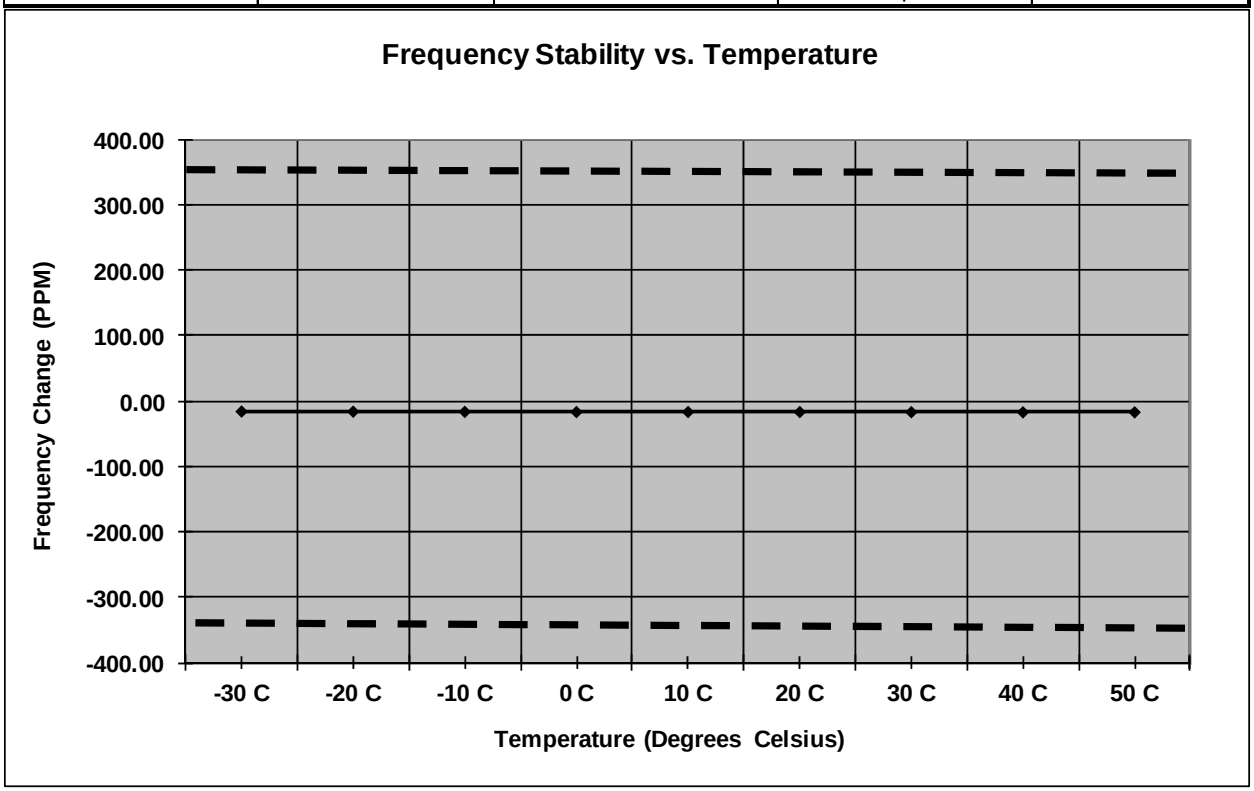

Figure 7.5.2-1: Frequency Stability – Low Channel

Frequency Stability

Frequency (MHz): 3299

Deviation Limit (PPM): 350ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**3298.945301**	**-16.580**	100%	12.00
-20 C	**3298.945121**	**-16.635**	100%	12.00
-10 C	**3298.943947**	**-16.991**	100%	12.00
0 C	**3298.942768**	**-17.348**	100%	12.00
10 C	**3298.943148**	**-17.233**	100%	12.00
20 C	**3298.942901**	**-17.308**	100%	12.00
30 C	**3298.942021**	**-17.575**	100%	12.00
40 C	**3298.941507**	**-17.731**	100%	12.00
50 C	**3298.941540**	**-17.721**	100%	12.00
20 C	**3298.942537**	**-17.418**	Endpoint	7.00

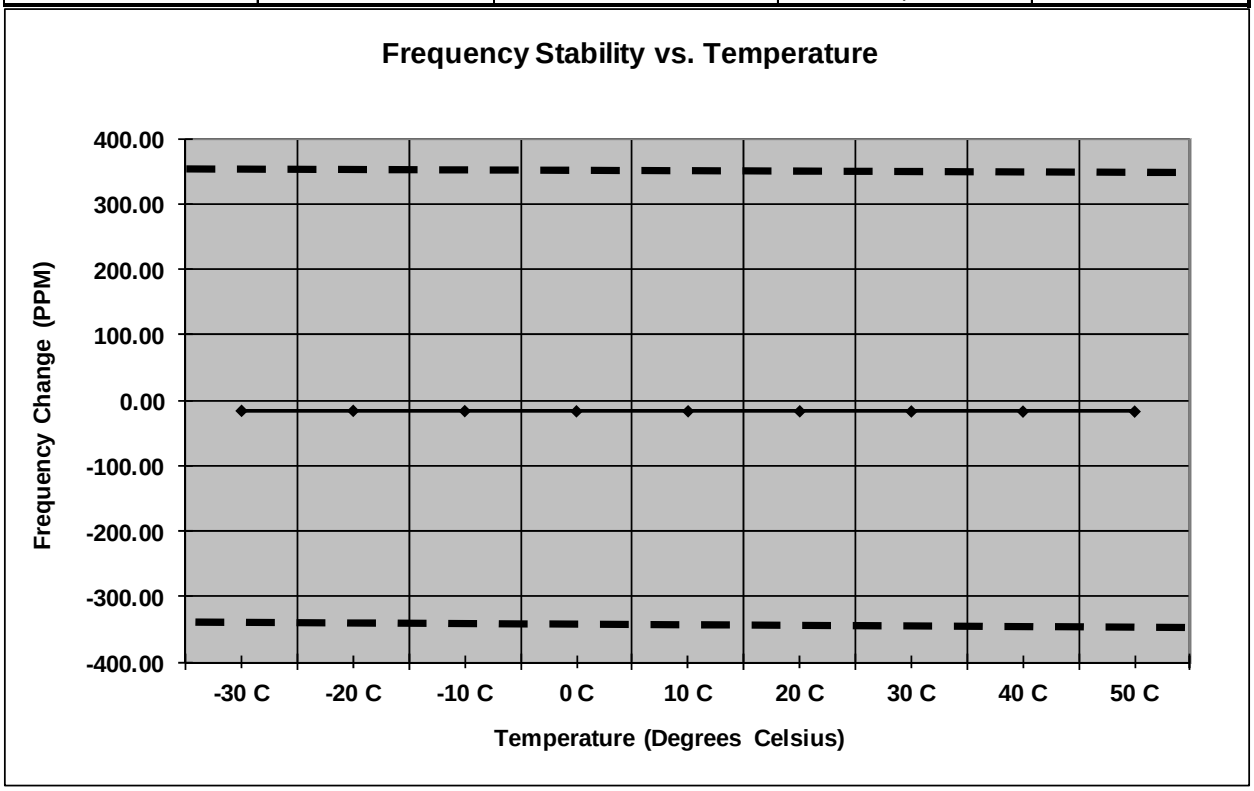

Figure 7.5.2-2: Frequency Stability – Middle Channel

Frequency Stability

Frequency (MHz): 3499

Deviation Limit (PPM): 350ppm

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(PPM)	(%)	(VDC)
-30 C	**3498.941973**	**-16.584**	100%	12.00
-20 C	**3498.941747**	**-16.648**	100%	12.00
-10 C	**3498.940343**	**-17.050**	100%	12.00
0 C	**3498.939305**	**-17.346**	100%	12.00
10 C	**3498.939681**	**-17.239**	100%	12.00
20 C	**3498.939327**	**-17.340**	100%	12.00
30 C	**3498.938415**	**-17.601**	100%	12.00
40 C	**3498.937887**	**-17.752**	100%	12.00
50 C	**3498.937995**	**-17.721**	100%	12.00
20 C	**3498.939187**	**-17.380**	Endpoint	7.00

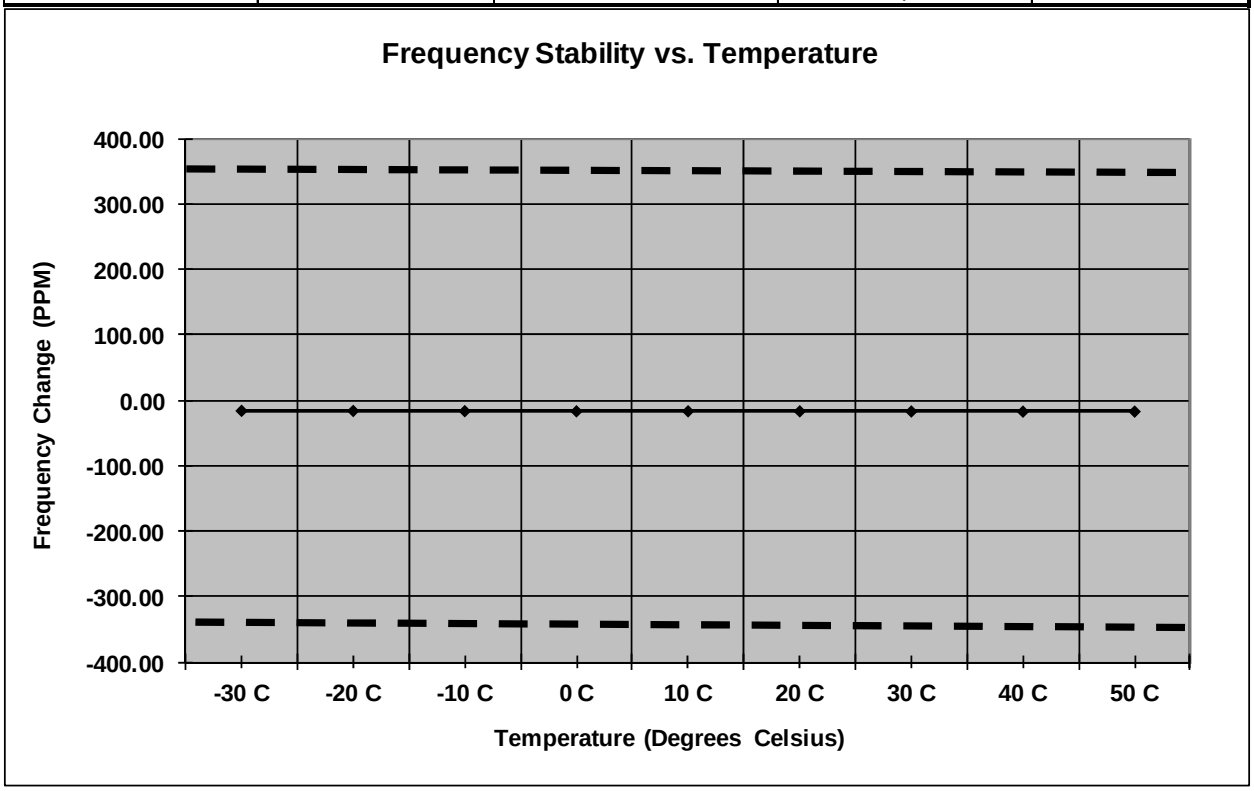

Figure 7.5.2-3: Frequency Stability – High Channel

8.0 CONCLUSION

In the opinion of ACS, Inc. the model Range-R 2D, manufactured by L-3 Communications CyTerra Corporation meets all the requirements of FCC Part 90 and DA 09-2482 as applicable.

End Report