Spider Tracks Limited

TEST REPORT FOR

Spider 7, Spider 7 Internal Antenna

Tested To The Following Standard(s)/Specification(s):
RTCA/DO-160F (2007)

Sections:
15, 21.4 and 21.5

Report No.: 97584-3

Date of issue: October 12, 2015

CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:	REPORT PREPARED BY:
Spider Tracks Limited 203/150 Karangahape Rd. Auckland 1010 New Zealand	Valerie Honsinger CKC Laboratories, Inc. 5046 Sierra Pines Drive Mariposa, CA 95338
Representative: Sonja Ridder	Project Number: 97584

DATE OF EQUIPMENT RECEIPT: October 06, 2015
DATE(S) OF TESTING: October 06 - 07, 2015

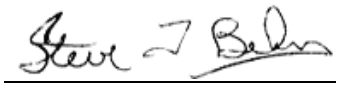
SCOPE: To demonstrate testing of the Spider 7, Spider 7 Internal Antenna meets the requirements for RTCA/DO-160F.

APPLICABLE DOCUMENTS:

- RTCA/DO-160F (December 6, 2007) Environmental Conditions and Test Procedures for Airborne Equipment.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Bothell, WA 98021-4413

Bothell - Semi-Anechoic Military/Aerospace EMC Chamber descriptions:

CKC Laboratories, Inc. operates three solid wall semi-anechoic chambers and one fully-anechoic chamber at their Bothell, Washington facility located in the Canyon Park business park. These chambers have attached solid wall ante-rooms for placement of support equipment and assisting in reducing ambient RF Emissions and RF leakage during RF susceptibility testing. The largest chamber does not have a solid wall ante-room.

Testing for this project was performed in the fully-anechoic C1 chamber. The dimensions of fully-anechoic chambers used for all Military/Aerospace EMC testing are as follows:
CP-C1: Chamber is 30'w x 16'd x 11'h

The shielded enclosures are designed to attenuate radio frequency noise over 100 dB up to 1GHz, and over 70 dB up to 40GHz.

The walls and ceiling of the semi-anechoic chambers have been treated with RF absorbing ferrite tiles and 1 foot RF absorbing cones in order to achieve uniform RF absorption from 10MHz to 40GHz. The minimum absorption performance at normal incidence exceeds the requirements of DO-160F Section 20 paragraph 20.3.b.(5) and table 20-3 as shown below:

10MHz	≥9dB	425MHz	≥38dB
80MHz	≥17dB	1GHz	≥25dB
250MHz	≥27dB	40GH	≥30dB

All input power to the room is filtered at its point of entry. The filters provide 100dB of insertion loss over the frequency range of 10kHz to 40GHz.

Ground Plane descriptions:

The ground plane used for all EMC testing is bonded to a wooden test bench. The dimensions are as follows:
CP-C1: 12' long x 3.5' deep x 0.025" thick copper bonded to bench surface.

The ground planes are bonded to the shielded enclosure wall at a minimum of once every 20 inches using copper bonding straps 12" in length x 4" in width exceeding the 5:1 length to width ratio requirements of DO-160F Section 20 para 20.3.a.(1).

Software Versions

CKC EMITest Emissions: 5.02.00
CKC Immunity: 5.02.00
NEXIO BAT-EMC: 3.10.0.14

UNIT UNDER TEST (UUT) DESCRIPTION

The Spider 7 contains the PCB Board listed below.

UNIT UNDER TEST

Spider 7
Manuf: Spider Tracks Limited
Model: Spider 7 Internal Antenna
Serial: 2015BETA33

PCB Board
Manuf: Spider Tracks Limited
Model: V3.5
Serial: N/A

PERIPHERAL DEVICES

The UUT was not tested with peripheral devices.

Mode / Configuration

Mode/Configuration Definitions	
Mode/Configuration	**Definition/Description**
1	Transmitting location data via Iridium. Bluetooth low energy transmitter is operational

SUMMARY OF RESULTS

Standard / Specification: RTCA/DO-160F

Test Description	Results	Category	Outcome
15 - Magnetic Effect	A deflection of 1° was not observed on any of the surfaces tested, which meets the requirements for Category Z. The surfaces of the UUT tested were as follows: front, back, top, bottom left side and right sides.	**Z**	**PASS**
21.4 - Conducted Emission of Radio Frequency Energy	The UUT exhibited no emissions exceeding the limit from 150kHz to 152MHz on the 28VDC Power Line and the Return line.	**M**	**PASS**
21.5 - Radiated Emission of Radio Frequency Energy	The UUT exhibited no emissions exceeding the limit from 100MHz to 6GHz in horizontal and vertical antenna polarizations.	**M**	**PASS**

Bonding Resistance Measurements

Bonding Resistance Measurements:
UUT was isolated 5cm above the EMI Ground Plane, therefore no Bonding Resistance Measurements were required.

RTCA/DO-160F

Section 15 – Magnetic Effect Category Z

Test Equipment					
Asset	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02566	Compass, 1 Degree	Weems & Plath	None	06/10/15	06/10/17
03273	Gaussmeter	FW Bell	6010	12/13/13	12/13/15
P06220	Zero Gauss Chamber	FW Bell	YA-112	02/26/14	02/26/16
03442	Probe	Meggitt	MOW61-2506-05	12/13/13	12/13/15

Test Procedure
With the UUT and its cabling oriented along a magnetic west to east axis, the 1° degree resolution magnetic compass was placed 3.0 meters from the UUT. The UUT was turned ON and a reference reading was made. The UUT was moved from east to west towards the compass until a 1° needle deflection was observed or the compass and/or UUT to compass gap was 0 cm.

The UUT was rotated so that its left side faced the compass. The UUT was returned to the 3-meter distance and the test was repeated. Testing was also repeated with the back and right sides of the UUT facing the compass. Then, the UUT was laid down so the top was facing the compass and testing was repeated. The UUT was rotated so the bottom was facing the compass and the test was repeated.

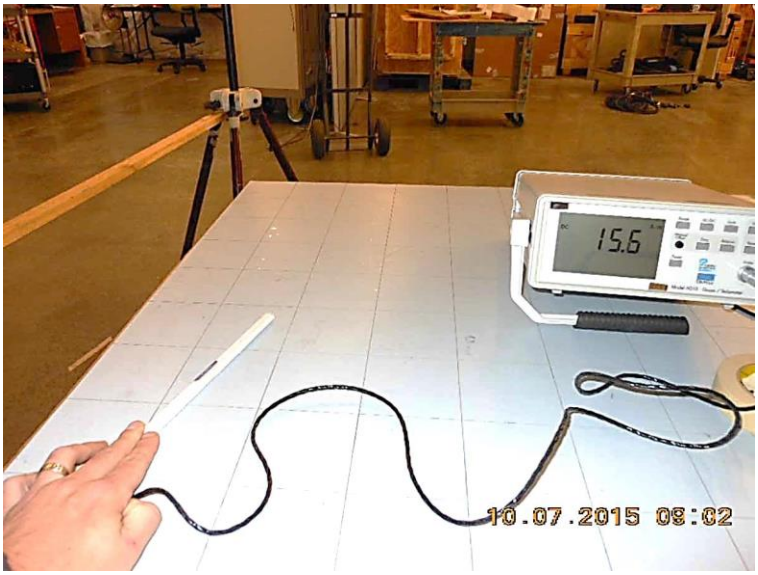
A deflection of 1° was not observed on any of the surfaces tested, meeting the requirements for **Category Z.** DO-160G Section 15 is based on a Horizontal Intensity of 14.4 A/m ±10%.

Horizontal Intensity of the test site is: 15.6A/m.

$$Dc = \frac{14.4}{\text{Horizontal Component of Ambient Field Strength}}$$

Test Results		
Mode/Config #	**Surface**	**Measurement m**
1	Front surface	Never reached 1° deflection
1	Right surface	Never reached 1° deflection
1	Back surface	Never reached 1° deflection
1	Left surface	Never reached 1° deflection
1	Top surface	Never reached 1° deflection
1	Bottom surface	Never reached 1° deflection

Section 15 Magnetic Effect Test Setup Photos



Section 15 - Gauss Meter Reading

Section 15 - Magnetic Effects, View 1

Section 15 - Magnetic Effects, View 2

Section 15 - Magnetic Effects, View 3

Section 15 - Magnetic Effects, View 4

Section 15 - Magnetic Effects, View 5

Section 15 - Magnetic Effects, View 6

Section 21.4 – Conducted Emission of Radio Frequency Energy Category M

Test Equipment

See data sheets for Test Equipment

Test Procedure

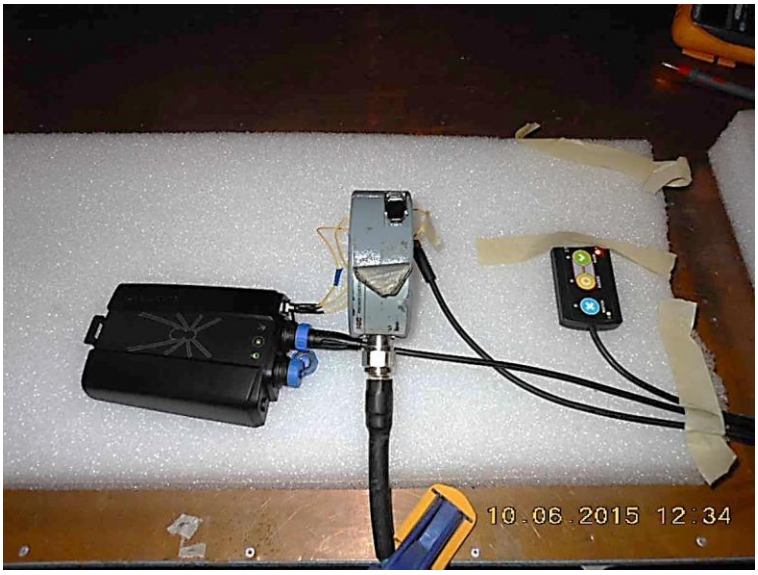
With the UUT on the ground plane and all the cables under test on 5 cm standoffs, the power was routed to the UUT through Line Impedance Stabilization Networks (LISNs). The current probe was clamped around the test lead/cable 5cm from the UUT. A scan of the emissions was made from 150kHz to 152MHz. Testing was repeated as necessary for the modes/configurations and/or leads/cables tested in the table below.

Test Results

Mode/Config #	Lead/Cable Tested	Seq #	Results	Cat
1	+28Vdc	7	Pass	M
1	Return	8	Pass	M

Section 21.4 Conducted RF Emissions Test Setup Photos

Section 21.4 - 28VDC Input Power Lead



Section 21.4 - Return Lead

Section 21.4 Test Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.4, Category M, Power Lines**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Conducted Emissions**	Time:	12:28:55 PM
Tested By:	Steven Pittsford	Sequence#:	7
Software:	EMITest 5.02.00		28VDC

Equipment Tested:

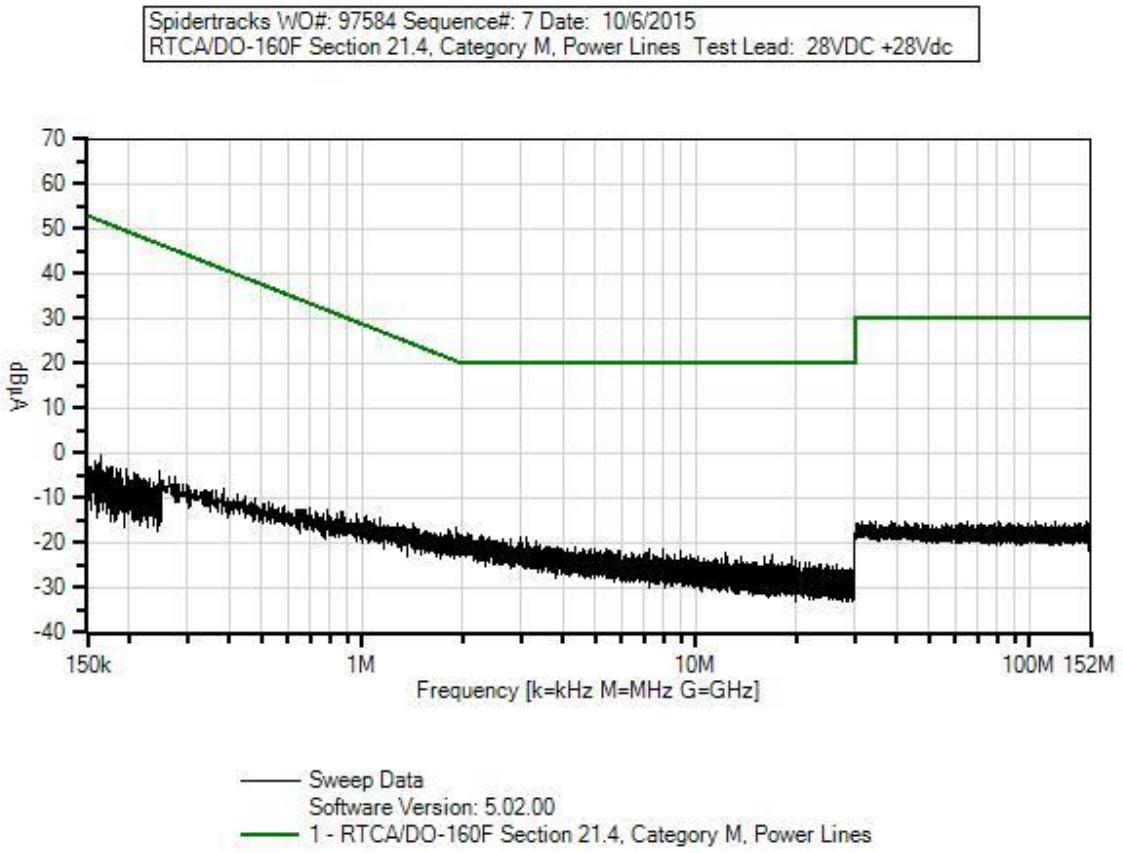
Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 150k-152MHz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T2	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
T3	AN02814	Current Probe	F-51	2/25/2014	2/25/2016
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016

Measurement Data: Reading listed by margin. Test Lead: +28Vdc

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµA	Spec dBµA	Margin dB	Polar Ant
1	1.905M	-4.9	+0.1	+0.0	-11.8		+0.0	-16.6	20.6	-37.2	+28Vd
2	30.000M	0.2	+0.3	+0.1	-18.0		+0.0	-17.4	20.0	-37.4	+28Vd
3	1.950M	-5.6	+0.1	+0.0	-11.9		+0.0	-17.4	20.3	-37.7	+28Vd
4	2.061M	-5.8	+0.1	+0.0	-12.1		+0.0	-17.8	20.0	-37.8	+28Vd
5	1.994M	-6.1	+0.1	+0.0	-12.0		+0.0	-18.0	20.0	-38.0	+28Vd
6	2.282M	-5.6	+0.1	+0.0	-12.6		+0.0	-18.1	20.0	-38.1	+28Vd
7	2.116M	-6.1	+0.1	+0.0	-12.2		+0.0	-18.2	20.0	-38.2	+28Vd
8	2.415M	-5.6	+0.1	+0.0	-12.8		+0.0	-18.3	20.0	-38.3	+28Vd
9	1.803M	-5.5	+0.1	+0.0	-11.6		+0.0	-17.0	21.3	-38.3	+28Vd
10	1.840M	-5.6	+0.1	+0.0	-11.7		+0.0	-17.2	21.1	-38.3	+28Vd
11	2.011M	-6.6	+0.1	+0.0	-12.0		+0.0	-18.5	20.0	-38.5	+28Vd
12	2.994M	-5.1	+0.1	+0.0	-13.5		+0.0	-18.5	20.0	-38.5	+28Vd
13	2.310M	-6.1	+0.1	+0.0	-12.6		+0.0	-18.6	20.0	-38.6	+28Vd
14	3.122M	-5.1	+0.1	+0.0	-13.6		+0.0	-18.6	20.0	-38.6	+28Vd
15	2.238M	-6.3	+0.1	+0.0	-12.5		+0.0	-18.7	20.0	-38.7	+28Vd

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.4, Category M, Power Lines**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Conducted Emissions**	Time:	1:02:58 PM
Tested By:	Steven Pittsford	Sequence#:	8
Software:	EMITest 5.02.00		28VDC

Equipment Tested:

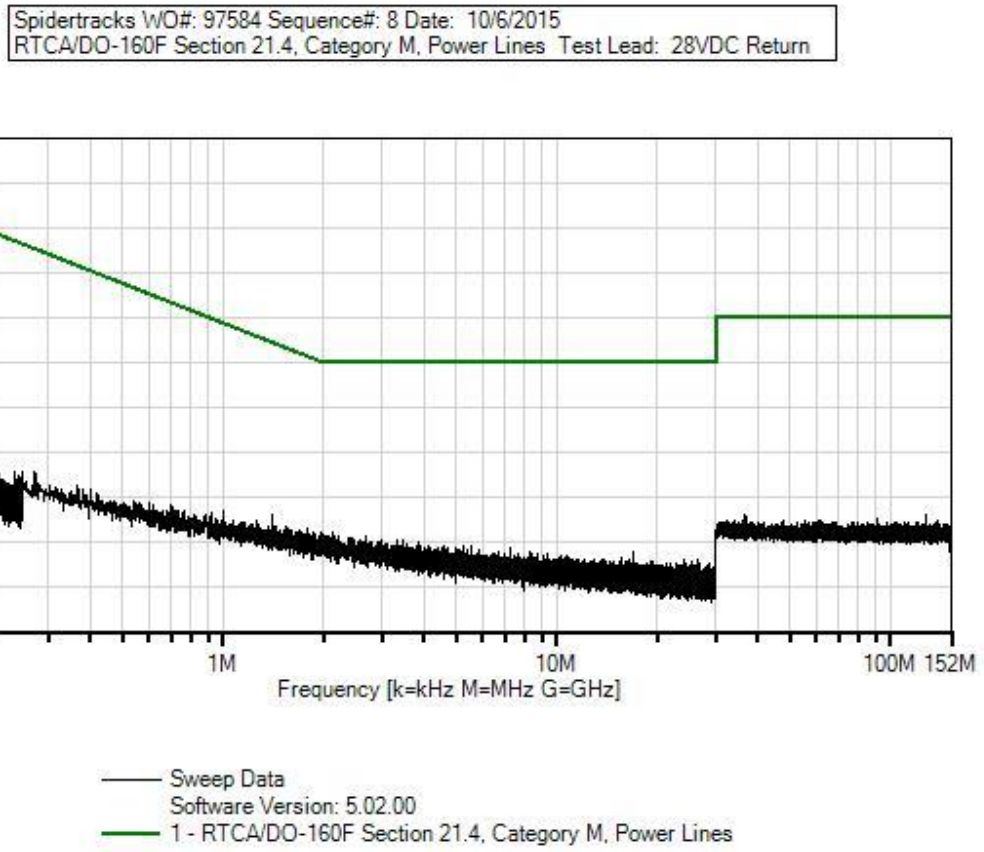
Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 150k-152MHz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T2	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
T3	AN02814	Current Probe	F-51	2/25/2014	2/25/2016
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016

Measurement Data: Reading listed by margin. Test Lead: Return

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµA	Spec dBµA	Margin dB	Polar Ant
1	30.000M	0.5	+0.3	+0.1	-18.0		+0.0	-17.1	20.0	-37.1	Retur
2	2.138M	-5.3	+0.1	+0.0	-12.3		+0.0	-17.5	20.0	-37.5	Retur
3	1.975M	-5.9	+0.1	+0.0	-12.0		+0.0	-17.8	20.2	-38.0	Retur
4	1.407M	-3.3	+0.1	+0.0	-10.6		+0.0	-13.8	24.5	-38.3	Retur
5	1.784M	-5.3	+0.1	+0.0	-11.6		+0.0	-16.8	21.5	-38.3	Retur
6	2.221M	-6.1	+0.1	+0.0	-12.4		+0.0	-18.4	20.0	-38.4	Retur
7	2.025M	-6.5	+0.1	+0.0	-12.1		+0.0	-18.5	20.0	-38.5	Retur
8	1.873M	-6.1	+0.1	+0.0	-11.7		+0.0	-17.7	20.8	-38.5	Retur
9	1.859M	-6.0	+0.1	+0.0	-11.7		+0.0	-17.6	20.9	-38.5	Retur
10	2.081M	-6.5	+0.1	+0.0	-12.2		+0.0	-18.6	20.0	-38.6	Retur
11	2.663M	-5.6	+0.1	+0.0	-13.1		+0.0	-18.6	20.0	-38.6	Retur
12	2.036M	-6.7	+0.1	+0.0	-12.1		+0.0	-18.7	20.0	-38.7	Retur
13	2.160M	-6.6	+0.1	+0.0	-12.3		+0.0	-18.8	20.0	-38.8	Retur
14	1.938M	-6.7	+0.1	+0.0	-11.9		+0.0	-18.5	20.4	-38.9	Retur
15	2.381M	-6.3	+0.1	+0.0	-12.8		+0.0	-19.0	20.0	-39.0	Retur

Section 21.5 – Radiated Emission of Radio Frequency Energy Category M

Deviates from Standard / Customer Test Procedure
No
Justification of UUT's worst case orientation *(If all UUT apertures are not exposed to the receive antenna, justification must be documented in the test report.)* **All UUT apertures are exposed to the receive antenna.**

Test Equipment

See data sheets for Test Equipment

Test Procedure

The UUT was powered up. The measurement antenna was placed 1 meter in front of the UUT, at a centered height of 0.3m above the EMI Ground Plane and was connected into the measurement system. The EMITest™ software automatically scanned across the frequency ranges in both horizontal and vertical antenna polarizations. Antennas were changed as necessary to complete the entire range as shown in the Results Table below. Scans were repeated for each conf/mode as listed below.

Antenna Positions		
Freq Range	**Antenna Position #**	**Description (Include Distances)**
100-6000MHz	1	Centered on the UUT 1 meter away

Test Results						
Mode / Config #	**Frequency Range**	**Polarity**	**Antenna Position**	**Seq #**	**Results**	**Cat**
1	100-200MHz	Horizontal	1	1	Pass	M
1	100-200MHz	Vertical	1	2	Pass	M
1	200-1000MHz	Horizontal	1	3	Pass	M
1	200-1000MHz	Vertical	1	4	Pass	M
1	1-6GHz	Horizontal	1	5	Pass	M
1	1-6GHz	Vertical	1	6	Pass	M

Section 21.5 Radiated RF Emissions Test Setup Photos

Section 21.5 - Bicon Antenna, 100 - 200MHz, Horizontal Polarization

Section 21.5 - Bicon Antenna, 100 - 200MHz, Vertical Polarization

Section 21.5 - Log Antenna, 200MHz - 1GHz, Horizontal Polarization

Section 21.5 - Log Antenna, 200MHz - 1GHz, Vertical Polarization

Section 21.5 - HF Horn Antenna, 1 - 6GHz, Horizontal Polarization

Section 21.5 - HF Horn Antenna, 1 - 6GHz, Vertical Polarization

Section 21.5 Test Data Sheets

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.5, Category M**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Radiated Scan**	Time:	9:35:15 AM
Tested By:	Steven Pittsford	Sequence#:	1
Software:	EMITest 5.02.00		

Equipment Tested:

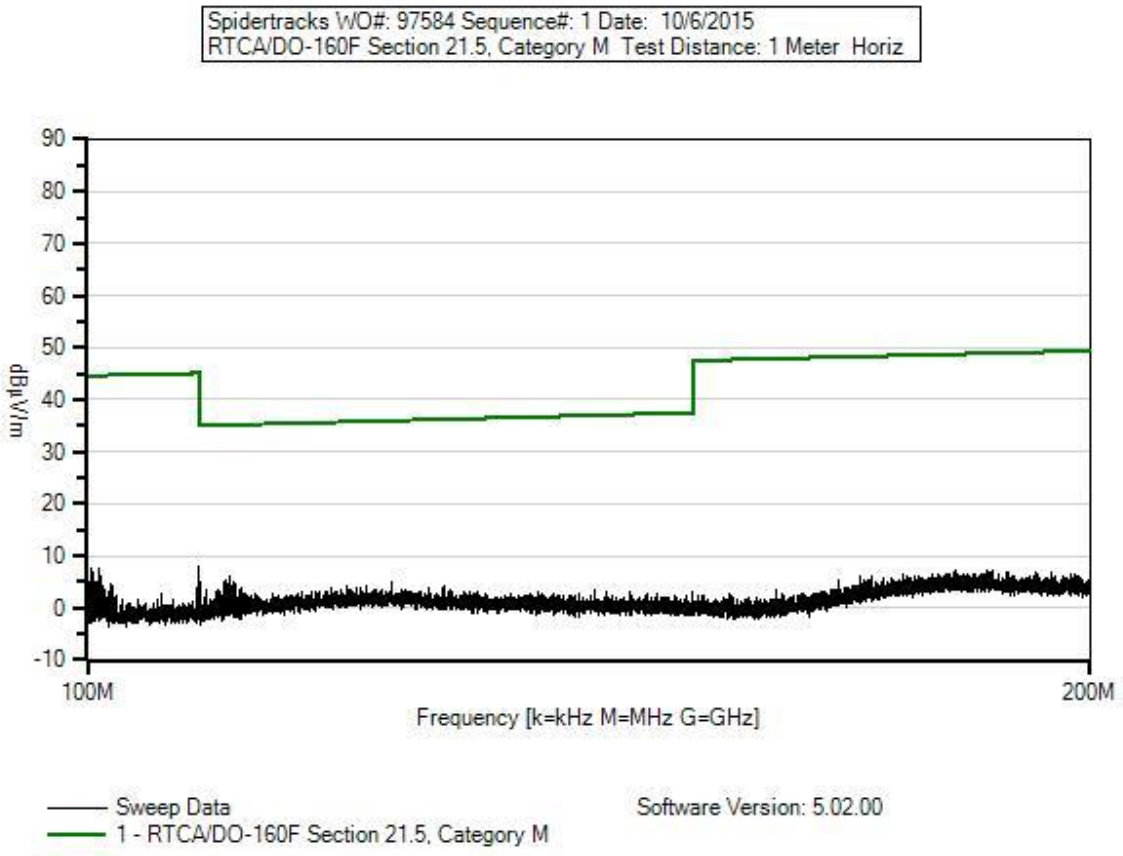
Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 100-200MHz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
T1	AN02308	Preamp	8447D	3/26/2014	3/26/2016
T2	AN00206	Bicon Antenna-ARP958 Calibration (Extrapolated)	SAS-200/540	5/27/2015	5/27/2017
T3	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T4	ANP05373	Cable	RG-214	8/28/2014	8/28/2016
T5	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	108.008M	22.6	-27.8 +0.3	+12.5	+0.5	+0.0	+0.0	8.1	35.0	-26.9	Horiz
2	110.390M	20.4	-27.8 +0.3	+12.9	+0.5	+0.0	+0.0	6.3	35.2	-28.9	Horiz
3	110.020M	19.7	-27.8 +0.3	+12.8	+0.5	+0.0	+0.0	5.5	35.1	-29.6	Horiz
4	108.188M	19.8	-27.8 +0.3	+12.5	+0.5	+0.0	+0.0	5.3	35.0	-29.7	Horiz
5	110.581M	19.4	-27.8 +0.3	+12.9	+0.5	+0.0	+0.0	5.3	35.2	-29.9	Horiz
6	109.840M	19.3	-27.8 +0.3	+12.8	+0.5	+0.0	+0.0	5.1	35.1	-30.0	Horiz
7	110.771M	18.8	-27.8 +0.3	+13.0	+0.5	+0.0	+0.0	4.8	35.2	-30.4	Horiz
8	110.210M	18.6	-27.8 +0.3	+12.9	+0.5	+0.0	+0.0	4.5	35.1	-30.6	Horiz
9	123.353M	17.3	-27.7 +0.3	+14.7	+0.6	+0.0	+0.0	5.2	36.0	-30.8	Horiz
10	111.311M	17.8	-27.8 +0.3	+13.1	+0.5	+0.0	+0.0	3.9	35.2	-31.3	Horiz
11	108.559M	18.0	-27.8 +0.3	+12.6	+0.5	+0.0	+0.0	3.6	35.0	-31.4	Horiz
12	109.479M	18.0	-27.8 +0.3	+12.7	+0.5	+0.0	+0.0	3.7	35.1	-31.4	Horiz
13	119.690M	16.8	-27.7 +0.3	+14.5	+0.5	+0.0	+0.0	4.4	35.8	-31.4	Horiz
14	111.131M	17.6	-27.8 +0.3	+13.1	+0.5	+0.0	+0.0	3.7	35.2	-31.5	Horiz
15	121.321M	16.7	-27.7 +0.3	+14.6	+0.5	+0.0	+0.0	4.4	35.9	-31.5	Horiz

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.5, Category M**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Radiated Scan**	Time:	9:49:20 AM
Tested By:	Steven Pittsford	Sequence#:	2
Software:	EMITest 5.02.00		

Equipment Tested:

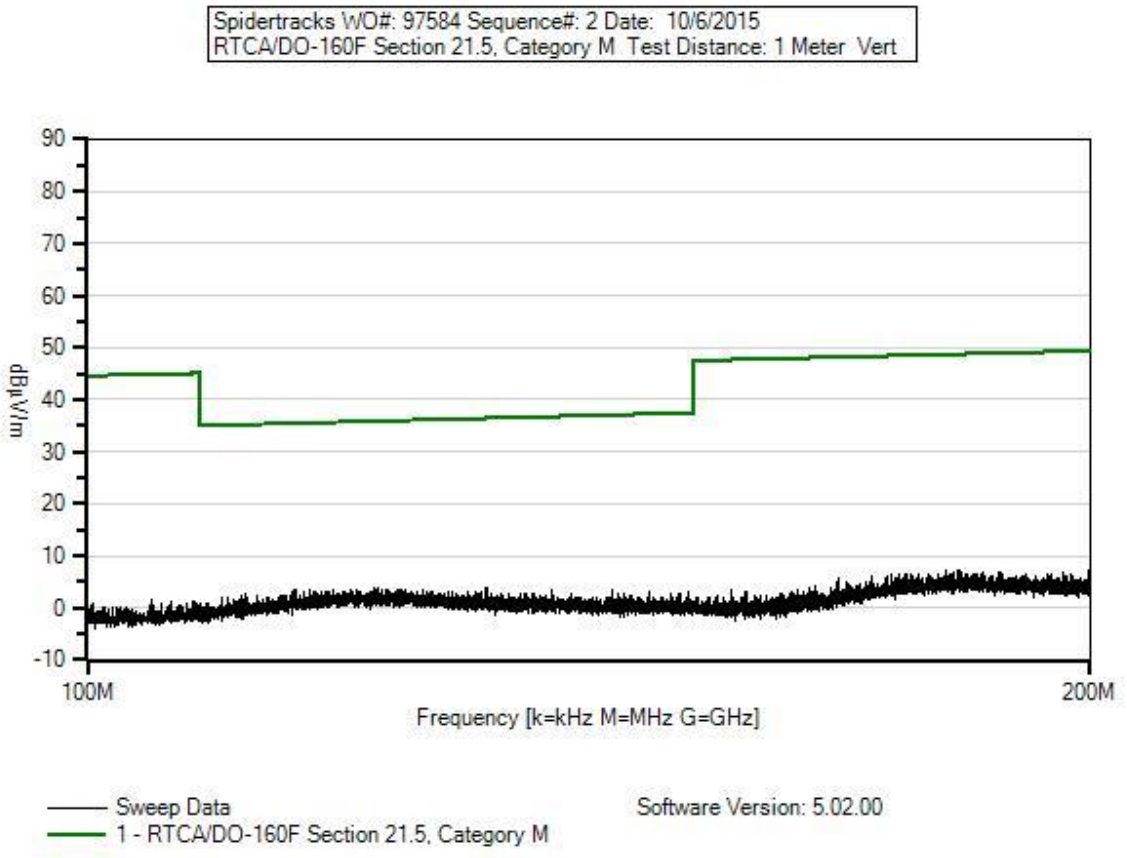
Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 100-200MHz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
T1	AN02308	Preamp	8447D	3/26/2014	3/26/2016
T2	AN00206	Bicon Antenna-ARP958 Calibration (Extrapolated)	SAS-200/540	5/27/2015	5/27/2017
T3	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T4	ANP05373	Cable	RG-214	8/28/2014	8/28/2016
T5	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	115.485M	16.5	-27.7 +0.3	+13.9	+0.5	+0.0	+0.0	3.5	35.5	-32.0	Vert
2	115.355M	16.5	-27.7 +0.3	+13.9	+0.5	+0.0	+0.0	3.5	35.5	-32.0	Vert
3	122.182M	16.1	-27.7 +0.3	+14.7	+0.5	+0.0	+0.0	3.9	35.9	-32.0	Vert
4	121.912M	16.2	-27.7 +0.3	+14.6	+0.5	+0.0	+0.0	3.9	35.9	-32.0	Vert
5	115.255M	16.4	-27.7 +0.3	+13.9	+0.5	+0.0	+0.0	3.4	35.5	-32.1	Vert
6	116.677M	16.3	-27.7 +0.3	+14.1	+0.5	+0.0	+0.0	3.5	35.6	-32.1	Vert
7	120.531M	16.0	-27.7 +0.3	+14.6	+0.5	+0.0	+0.0	3.7	35.8	-32.1	Vert
8	122.593M	15.8	-27.7 +0.3	+14.7	+0.5	+0.0	+0.0	3.6	35.9	-32.3	Vert
9	116.136M	16.1	-27.7 +0.3	+14.0	+0.5	+0.0	+0.0	3.2	35.5	-32.3	Vert
10	111.501M	16.8	-27.8 +0.3	+13.1	+0.5	+0.0	+0.0	2.9	35.2	-32.3	Vert
11	116.937M	16.1	-27.7 +0.3	+14.1	+0.5	+0.0	+0.0	3.3	35.6	-32.3	Vert
12	120.010M	15.8	-27.7 +0.3	+14.6	+0.5	+0.0	+0.0	3.5	35.8	-32.3	Vert
13	118.508M	15.9	-27.7 +0.3	+14.4	+0.5	+0.0	+0.0	3.4	35.7	-32.3	Vert
14	123.063M	15.8	-27.7 +0.3	+14.7	+0.5	+0.0	+0.0	3.6	36.0	-32.4	Vert
15	124.304M	15.7	-27.7 +0.3	+14.7	+0.6	+0.0	+0.0	3.6	36.0	-32.4	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.5, Category M**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Radiated Scan**	Time:	9:58:48 AM
Tested By:	Steven Pittsford	Sequence#:	3
Software:	EMITest 5.02.00		

Equipment Tested:

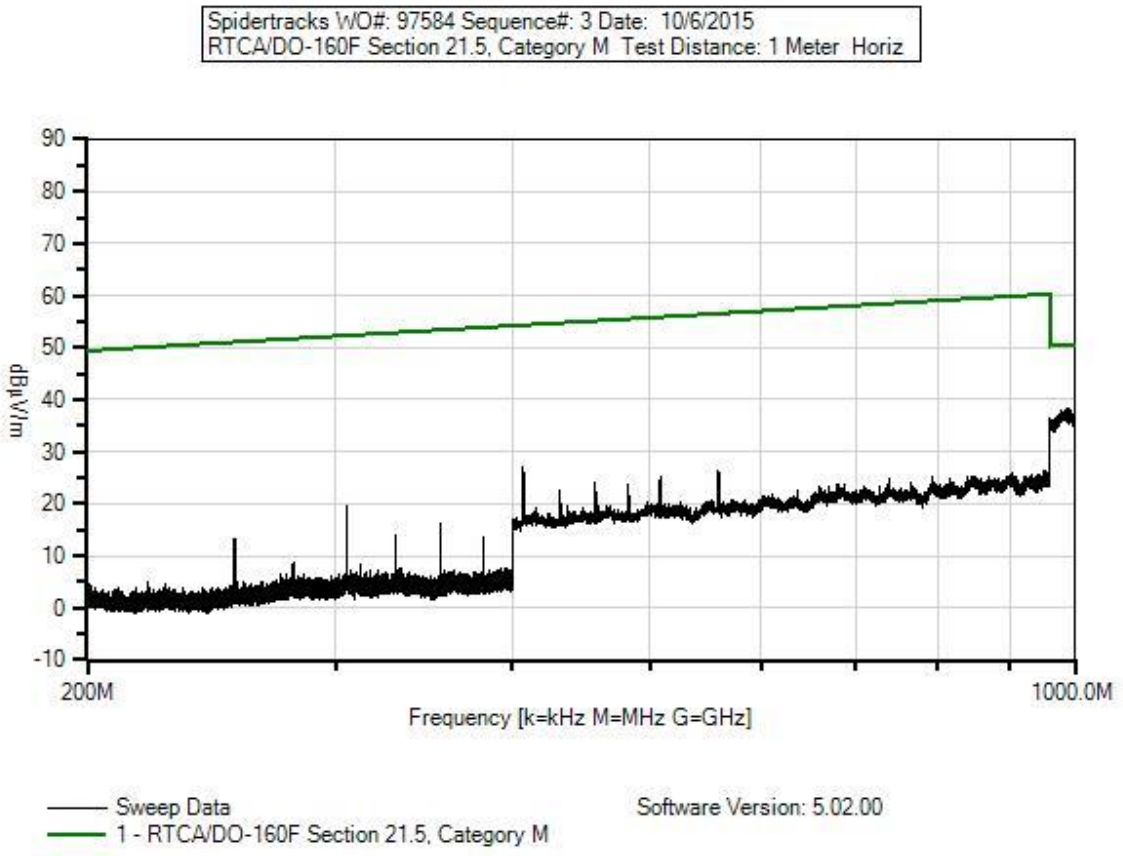
Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 200-1000MHz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
T1	AN02308	Preamp	8447D	3/26/2014	3/26/2016
T2	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T3	ANP05373	Cable	RG-214	8/28/2014	8/28/2016
T4	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016
T5	AN00147	Log Periodic Antenna-ARP-958	3146	3/11/2014	3/11/2016

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	988.960M	38.0	-27.1 +24.8	+1.7	+0.2	+0.9	+0.0	38.5	50.5	-12.0	Horiz
2	982.880M	37.9	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	38.2	50.5	-12.3	Horiz
3	983.160M	37.7	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	38.0	50.5	-12.5	Horiz
4	978.160M	37.5	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	37.8	50.4	-12.6	Horiz
5	977.840M	37.5	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	37.8	50.4	-12.6	Horiz
6	989.280M	37.4	-27.1 +24.8	+1.7	+0.2	+0.9	+0.0	37.9	50.5	-12.6	Horiz
7	979.400M	37.5	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	37.8	50.4	-12.6	Horiz
8	993.280M	37.2	-27.1 +24.9	+1.7	+0.2	+0.9	+0.0	37.8	50.5	-12.7	Horiz
9	980.080M	37.4	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	37.7	50.4	-12.7	Horiz
10	981.560M	37.4	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	37.7	50.5	-12.8	Horiz
11	987.520M	37.2	-27.1 +24.8	+1.7	+0.2	+0.9	+0.0	37.7	50.5	-12.8	Horiz
12	983.680M	37.3	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	37.6	50.5	-12.9	Horiz
13	960.160M	37.2	-27.3 +24.0	+1.7	+0.2	+0.8	+0.0	36.6	50.3	-13.7	Horiz
14	960.800M	37.1	-27.3 +24.0	+1.7	+0.2	+0.8	+0.0	36.5	50.3	-13.8	Horiz
15	969.320M	36.4	-27.2 +24.4	+1.7	+0.2	+0.9	+0.0	36.4	50.4	-14.0	Horiz

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.5, Category M**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Radiated Scan**	Time:	10:16:04 AM
Tested By:	Steven Pittsford	Sequence#:	4
Software:	EMITest 5.02.00		

Equipment Tested:

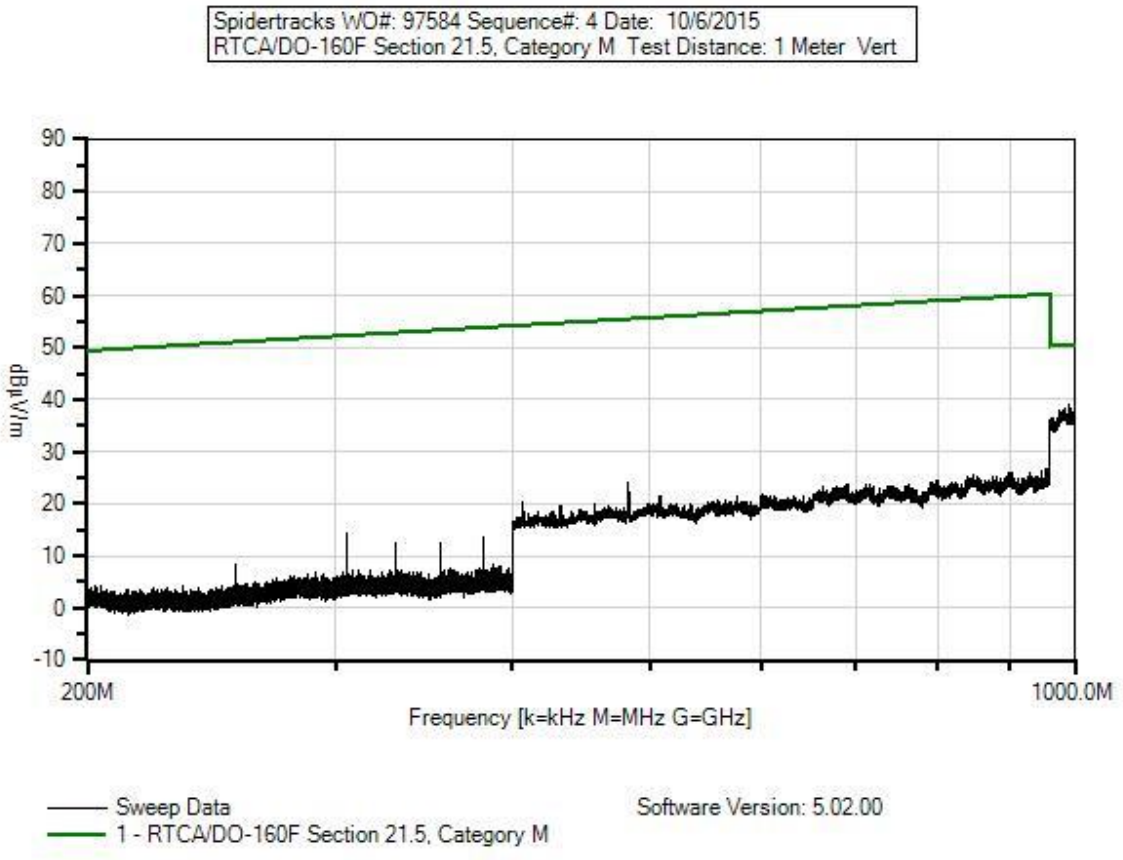
Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 200-1000MHz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
T1	AN02308	Preamp	8447D	3/26/2014	3/26/2016
T2	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T3	ANP05373	Cable	RG-214	8/28/2014	8/28/2016
T4	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016
T5	AN00147	Log Periodic Antenna-ARP-958	3146	3/11/2014	3/11/2016

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	989.360M	38.7	-27.1 +24.8	+1.7	+0.2	+0.9	+0.0	39.2	50.5	-11.3	Vert
2	982.960M	38.0	-27.2 +24.7	+1.7	+0.2	+0.9	+0.0	38.3	50.5	-12.2	Vert
3	993.880M	37.8	-27.1 +24.9	+1.7	+0.2	+0.9	+0.0	38.4	50.6	-12.2	Vert
4	974.960M	37.6	-27.2 +24.6	+1.7	+0.2	+0.9	+0.0	37.8	50.4	-12.6	Vert
5	997.960M	37.1	-27.1 +25.0	+1.7	+0.2	+0.9	+0.0	37.8	50.6	-12.8	Vert
6	976.160M	37.2	-27.2 +24.6	+1.7	+0.2	+0.9	+0.0	37.4	50.4	-13.0	Vert
7	998.960M	36.8	-27.1 +25.0	+1.7	+0.2	+0.9	+0.0	37.5	50.6	-13.1	Vert
8	974.080M	37.0	-27.2 +24.6	+1.7	+0.2	+0.9	+0.0	37.2	50.4	-13.2	Vert
9	483.283M	31.9	-28.1 +18.7	+1.1	+0.1	+0.6	+0.0	24.3	55.5	-31.2	Vert
10	954.943M	27.6	-27.3 +23.8	+1.7	+0.2	+0.8	+0.0	26.8	60.3	-33.5	Vert
11	896.596M	27.6	-27.4 +23.4	+1.6	+0.2	+0.8	+0.0	26.2	59.8	-33.6	Vert
12	407.007M	29.2	-27.7 +17.4	+1.0	+0.1	+0.5	+0.0	20.5	54.3	-33.8	Vert
13	848.648M	27.4	-27.5 +23.2	+1.6	+0.1	+0.8	+0.0	25.6	59.4	-33.8	Vert
14	928.108M	27.4	-27.3 +23.5	+1.6	+0.2	+0.8	+0.0	26.2	60.1	-33.9	Vert
15	947.089M	27.2	-27.3 +23.6	+1.7	+0.2	+0.8	+0.0	26.2	60.2	-34.0	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.5, Category M**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Radiated Scan**	Time:	10:51:21 AM
Tested By:	Steven Pittsford	Sequence#:	5
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

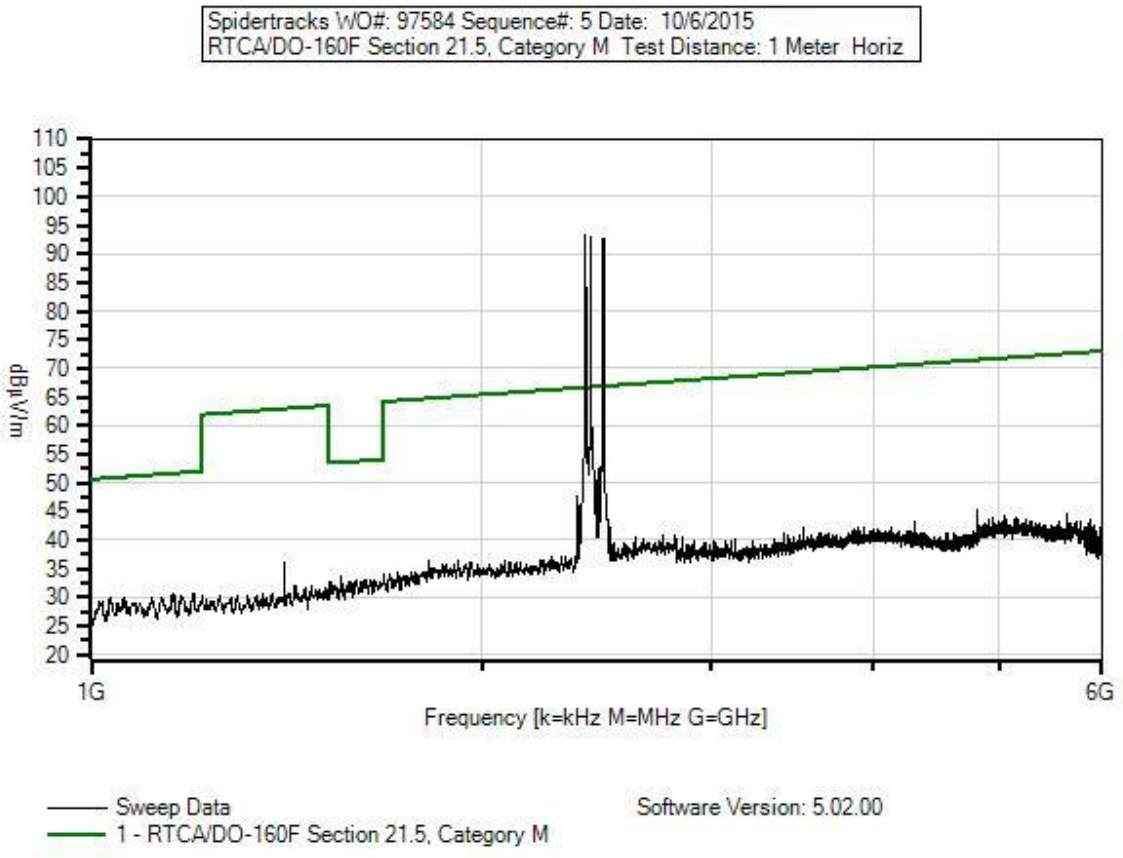
Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 1-6GHz

EUT contains a Bluetooth Low Energy transmitter. Transmitting at 2402, 2426 and 2480MHz these frequencies are ignored.



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
T1	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T2	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016
T3	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T4	AN02374	Horn Antenna-ARP958 Calibration	RGA-60	8/12/2015	8/12/2017

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	2402.706M	94.3	+2.7	+1.5	-34.6	+29.7	+0.0	93.6	66.7	+26.9	Horiz
	Ambient								Fundamental BLE		
2	2425.729M	93.7	+2.7	+1.6	-34.6	+29.7	+0.0	93.1	66.7	+26.4	Horiz
	Ambient								Fundamental BLE		
3	2479.783M	93.1	+2.7	+1.6	-34.5	+29.8	+0.0	92.7	66.9	+25.8	Horiz
	Ambient								Fundamental BLE		
4	2408.712M	59.3	+2.7	+1.5	-34.6	+29.7	+0.0	58.6	66.7	-8.1	Horiz
5	2432.736M	57.8	+2.7	+1.6	-34.6	+29.7	+0.0	57.2	66.8	-9.6	Horiz
6	2457.761M	52.8	+2.7	+1.6	-34.5	+29.8	+0.0	52.4	66.8	-14.4	Horiz
7	2448.752M	50.7	+2.7	+1.6	-34.5	+29.8	+0.0	50.3	66.8	-16.5	Horiz
8	2369.673M	48.6	+2.7	+1.5	-34.6	+29.6	+0.0	47.8	66.6	-18.8	Horiz
9	1555.642M	40.1	+2.1	+1.2	-35.5	+26.0	+0.0	33.9	53.6	-19.7	Horiz
10	1599.767M	39.0	+2.1	+1.2	-35.4	+26.2	+0.0	33.1	53.7	-20.6	Horiz
11	1623.463M	39.0	+2.1	+1.2	-35.4	+26.3	+0.0	33.2	53.8	-20.6	Horiz
12	1527.860M	39.0	+2.1	+1.2	-35.5	+26.0	+0.0	32.8	53.5	-20.7	Horiz
13	1156.887M	39.9	+1.9	+0.9	-36.8	+24.9	+0.0	30.8	51.6	-20.8	Horiz
14	1035.136M	40.2	+1.7	+0.9	-37.4	+24.5	+0.0	29.9	50.8	-20.9	Horiz
15	1615.292M	38.6	+2.1	+1.2	-35.4	+26.3	+0.0	32.8	53.8	-21.0	Horiz

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Spider Tracks Limited**		
Specification:	**RTCA/DO-160F Section 21.5, Category M**		
Work Order #:	**97584**	Date:	10/6/2015
Test Type:	**Radiated Scan**	Time:	11:10:00 AM
Tested By:	Steven Pittsford	Sequence#:	6
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Spider 7	Spider Tracks Limited	Spider 7 Internal Antenna	2015BETA33
Spider 7 contains PCB board	Spider Tracks Limited	V3.5	N/A

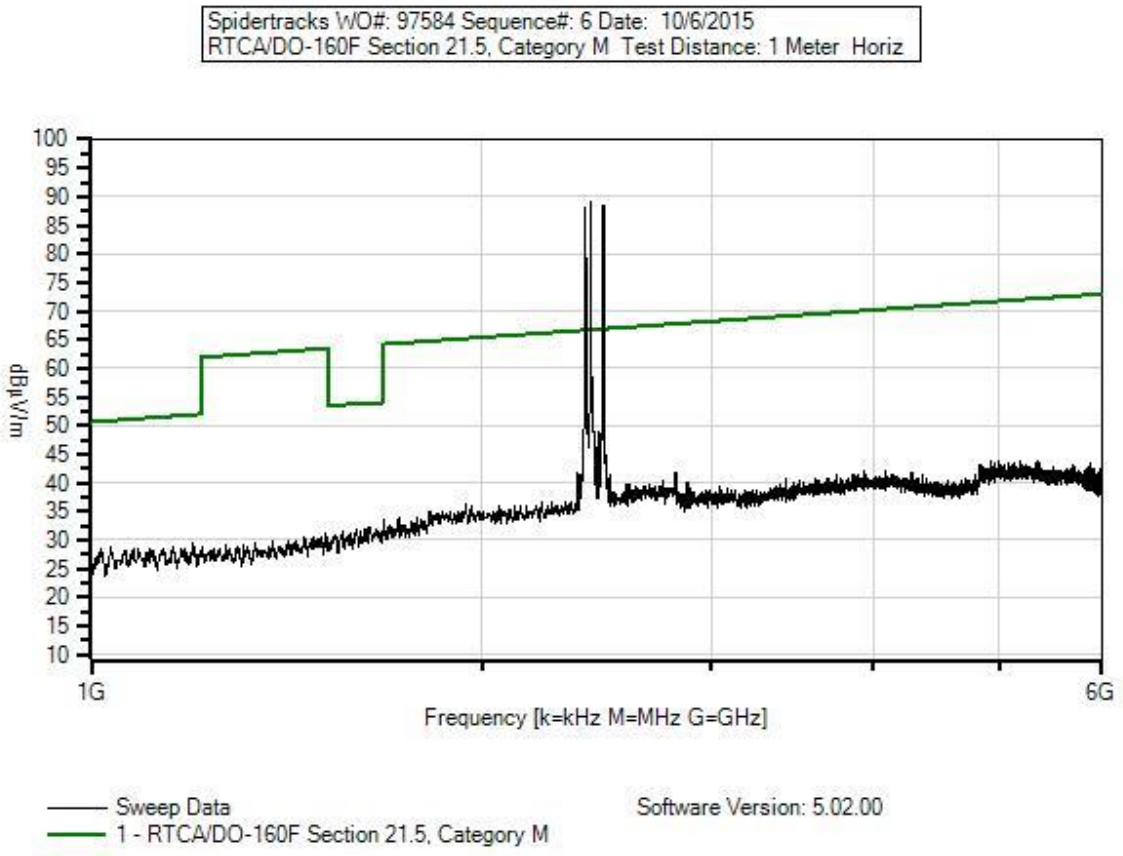
Support Equipment:

Device	Manufacturer	Model #	S/N

Test Conditions / Notes:

Frequency: 1-6GHz

EUT contains a Bluetooth Low Energy transmitter. Transmitting at 2402, 2426 and 2480MHz these frequencies are ignored.



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN03438	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN03439	5uH LISN-Amplitude (dB)	9117-5-TS-50-N	10/30/2013	10/30/2015
	AN00582	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
	ANP06031	Feed Through Capacitor	6512-106R	3/21/2014	3/21/2016
T1	ANP05333	Cable	Heliax	8/27/2015	8/27/2017
T2	ANP05960	Cable	Heliax 1/4	9/11/2015	9/11/2017
	AN02870	Spectrum Analyzer	E4440A	1/6/2014	1/6/2016
T3	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T4	AN02374	Horn Antenna-ARP958 Calibration	RGA-60	8/12/2015	8/12/2017

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	2425.729M	89.9	+2.7	+1.6	-34.6	+29.7	+0.0	89.3	66.7	+22.6	Horiz
	Ambient								Fundamental BLE		
2	2479.783M	89.1	+2.7	+1.6	-34.5	+29.8	+0.0	88.7	66.9	+21.8	Horiz
	Ambient								Fundamental BLE		
3	2402.706M	88.8	+2.7	+1.5	-34.6	+29.7	+0.0	88.1	66.7	+21.4	Horiz
	Ambient								Fundamental BLE		
4	2407.711M	54.0	+2.7	+1.5	-34.6	+29.7	+0.0	53.3	66.7	-13.4	Horiz
5	2432.736M	54.0	+2.7	+1.6	-34.6	+29.7	+0.0	53.4	66.8	-13.4	Horiz
6	2457.761M	49.4	+2.7	+1.6	-34.5	+29.8	+0.0	49.0	66.8	-17.8	Horiz
7	2448.752M	46.5	+2.7	+1.6	-34.5	+29.8	+0.0	46.1	66.8	-20.7	Horiz
8	1637.354M	38.1	+2.1	+1.2	-35.3	+26.4	+0.0	32.5	53.9	-21.4	Horiz
9	1599.767M	37.8	+2.1	+1.2	-35.4	+26.2	+0.0	31.9	53.7	-21.8	Horiz
10	1625.914M	37.6	+2.1	+1.2	-35.3	+26.4	+0.0	32.0	53.8	-21.8	Horiz
11	1035.953M	39.2	+1.7	+0.9	-37.4	+24.5	+0.0	28.9	50.8	-21.9	Horiz
12	1018.794M	39.1	+1.7	+0.9	-37.5	+24.5	+0.0	28.7	50.7	-22.0	Horiz
13	1562.179M	37.8	+2.1	+1.2	-35.5	+26.0	+0.0	31.6	53.6	-22.0	Horiz
14	1612.023M	37.5	+2.1	+1.2	-35.4	+26.3	+0.0	31.7	53.8	-22.1	Horiz
15	1583.424M	37.3	+2.1	+1.2	-35.4	+26.1	+0.0	31.3	53.7	-22.4	Horiz

TEST LOG

Date	Name	Time	Event
10/6/15	S. Pittsford	0800	Setup for **21.5 Radiated emissions**
		0930	01 Radiated emissions 100-200MHz Horz Pass
			02 Radiated emissions 100-200MHz Vert Pass
		0956	03 Radiated emissions 200-1000MHz Horz Pass
			04 Radiated emissions 200-1000MHz Vert Pass
		1032	05 Radiated emissions 1-6GHz Horz Pass
			06 Radiated emissions 1-6GHz Vert Pass
			Setup for **21.4 Conducted emissions**
		1234	07 Conducted emissions 150k-152MHz +28Vdc Pass
			08 Conducted emissions 150k-152MHz Return Pass
		1300	**Setup for voltage spikes**
10/7/15	S. Pittsford	0812	**Setup magnetic effect**
			Ambient mag field = 15.6A/m Never reached 1° deflection on any side
		0900	**Paperwork**