Application for Certification
For an UWB Ground Penetrating Radar System
(Snow Depth Sensor)

Campbell Scientific
815 West 1800 North
Logan, UT 81321

M/N: CS710

FCC ID: B9Q-CS710
IC ID: 802A-CS710

REPORT # UT56071A-003

This report was prepared in accordance with the requirements of the FCC Rules and Regulations Part 2, Subpart J, 2.1033, Part 15.509, IC RSS-220, and other applicable sections of the rules as indicated herein.

Prepared By:

DNB Engineering, Inc.
1100 E Chalk Creek Road
Coalville, UT 84017

3 July 2015
(Revision 10 Mar 2016)

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Paragraph numbers in this report follow the application section numbers found in the FEDERAL COMMUNICATIONS COMMISSION Rules and Regulations, Part 2, Subpart J for Certification of electronic equipment.

1.0 ADMINISTRATIVE DATA

1.1 Certifications and Qualifications

I certify that DNB Engineering, Inc conducted the tests performed in order to obtain the technical data presented in this application. Also, based on the results of the enclosed data, I have concluded that the equipment tested meets or exceeds the requirements of the Rules and Regulations governing this application.

1.2 Measurement Repeatability Information

The test data presented in this report has been acquired using the guidelines set forth in FCC Part 2.1031 through 2.1057, Part 15 and IC RSS-220. The test results presented in this document are valid only for the equipment identified herein under the test conditions described. Repeatability of these test results will only be achieved with identical measurement conditions. These conditions include: The same test distance, EUT Height, Measurement Site Characteristics, and the same EUT System Components. The system must have the same Interconnecting Cables arranged in identical placement to that in the test set-up, with the system and/or EUT functioning in the identical mode of operation (i.e. software and so on) as on the date of the test. Any deviation from the test conditions and the environment on the date of the test may result in measurement repeatability difficulties.

All changes made to the EUT during the course of testing as identified in this test report must be incorporated into the EUT or identical models to ensure compliance with the FCC regulations.

C. L. Payne III (Para. 1.1)
Facility Manager
Coalville Facility.
DNB Engineering, Inc.
Tel. (435) 336-4433
FAX (435) 336-4436

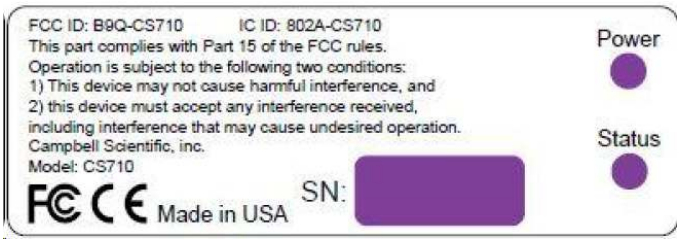
2.1033 (b) (1) Application for Certification

Name of Applicant:		Campbell Scientific 815 West 1800 North Logan, UT 81321
FRN Number:		000160500
Applicant is:	X	Campbell Scientific
Vendor		
Licensee		
Prospective Licensee		
Other		
Name of Manufacturer #1:		Campbell Scientific 815 West 1800 North Logan, UT 84321
Description:		Snow Depth Sensor
Model Number:		CS710
Anticipated Production Quantity:		Multiple Units
Frequency Band:		1.02175 to 6.44857 Ghz
Frequency Range Investigated:		From 30MHz to 38 GHz
Type of Signal:		UWB

2.1033 (b) (2) FCC Identifier

FCC ID: B9Q-CS710 IC ID: 802A-CS710

Figure 1 - Label and location



2.1033 (b) (3) Installation and Operating Instructions

Supplied separately. CS710 Manual Dated 9 Sep 2015

2.1033 (b) (4) Brief Description of Circuit Function

CS710 Operational Description

The purpose of the CS710 is to measure snow depth using ultra-wide-band radar.

The heart of the CS710 is the Novelda 6100 chip, which is a self-contained ultra-wide-band radar transmitter/receiver system. The radar transmit signal from the Novelda 6100 passes to a programmable attenuator, controlled by the DSP, and then to two gain stages, and then to the transmit antenna connector. The signal from the radar receiver antenna passes directly to the Novelda 6100. The CS710 is designed around the Novelda 6100 radar chip, any information about signal generation should be referred to the NVA6100 datasheet.

The CS710 is powered from 12 to 24 VDC. The DSP can be powered from USB, but not the radar system.

The CS710 can communicate with a CSI logger or PC via RS232 or USB (SDI-12, RS485, Canbus, not coded at this time).

A Texas Instruments TMS320C6745 digital signal processor processes the signals acquired by the Novelda 6100 and calculates snow depth.

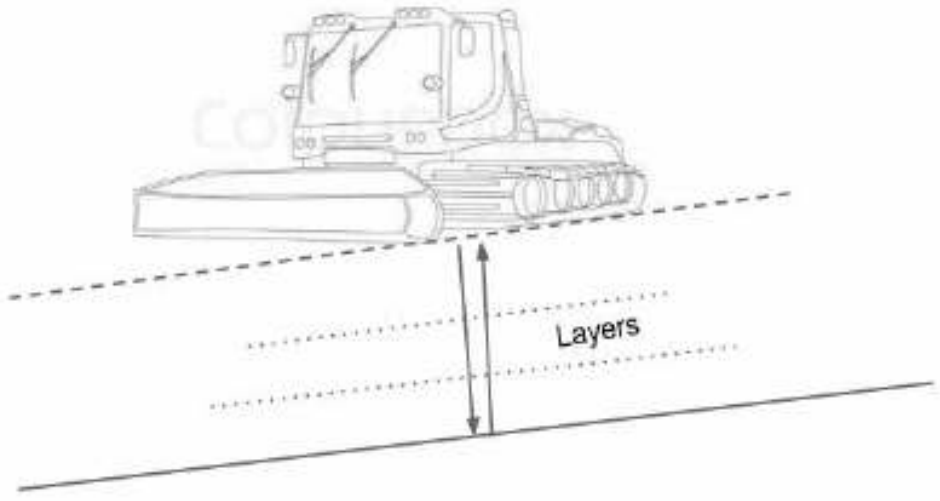


FIGURE 4-1. Radar Pulses Traveling Through Layers of Snow

2.1033 (b) (5) Block Diagram

Supplied separately.

2.1033 (b) (6) Summary Report of Measurements

Summary Report of Measurements					
Test Requirement	**FCC Rule Requirement**	**IC Rule Requirement**	**Test Report Pages**	**Result**	**Remarks**
Antenna Requirement	15.203	RSS-GEN 7.1.4	10	Compliant	Antenna is mounted within a sealed enclosure with the intentional radiator and mounted beneath the Snow Cat.
Conducted Emissions	15.207	RSS-GEN	11 - 12	Not Applicable	EUT is battery operated
Radiated Emissions (Below 960 MHz)	15.209	RSS-220 3.4	13 - 18	Compliant	
UWB Bandwidth	15.503 (a)	RSS-220 6.2.1 (a)	19 - 22	Compliant	
Operational Requirements	15.509 (b)	RSS-220 6	23	Compliant	
Hand-Held / Wall Imaging	15.509 (c)	RSS-220 6.2 (c)	24	Not Applicable	Not a hand-held or wall imaging device
Spurious Radiated Emissions	15.509 (d)	RSS-220 6.2 (d)	25 - 30	Compliant	
Radiated Emissions in GPS Bands	15.509 (e)	RSS-220 6.2 (e)	25 - 29, 31	Compliant	
Peak Emissions in a 50MHz Bandwidth	15.509 (f)	RSS-220 6.2 (g)	32 - 36	Compliant	
Radio Frequency Exposure	1.1307 (b) (1)	RSS-102	37	Compliant	Reference FCC 2.1093

15.203 [RSS-GEN 7.1.4] Antenna requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded

COMPLIANT - The antenna utilized by this device is mounted internally and can not be replaced by the user.

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15.207 [RSS-GEN] Conducted Emissions (General)

Test Procedure: As specified in IEEE C63.10

To measure conducted emissions, the EUT was set upon a wooden table in the shielded enclosure. AC power was fed into the EUT from the Artificial Mains Network. With the Artificial Mains Network connected to an Rhode & Schwarz FSV Signal and Spectrum Analyzer, and using Personal Computer with TILES Measurement Software, the spectrum was searched from 0.15 - 30 MHz for emissions emanating from the EUT.

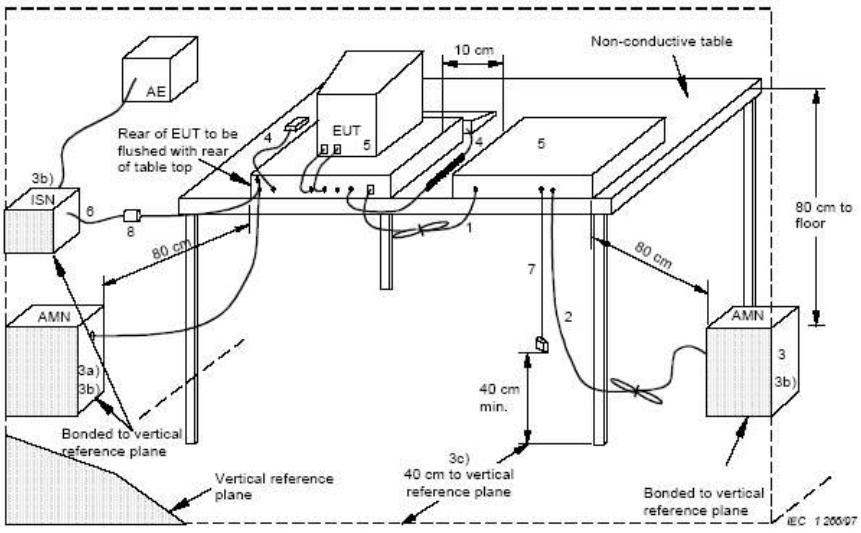
Frequency of emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

EUT operating conditions:

The software provided by the client to enable the EUT to transmit continuously.

Test Set Up:



1100 E Chalk Creek Road
Coalville, UT 84017
(435) 336-4433
FAX (435) 336-4436

Conducted Emissions

DNB Job Number:	56071	Date:	3 Jul 2015	Specification
Customer:	Campbell Scientific.			[X] 15.207 [X] RSS_GEN
Model Number:	CS710			
Description:	Snow Depth Sensor			
	Set Up			

Not Applicable - Device is battery operated.

15.209 [RSS-220 3.4] Radiated Emissions (General)

Test Procedure: IEEE C63.10

The EUT was measured on an open area test site (OATS).

A measuring distance of at least 3 m shall be used for measurements at frequencies up to 1 GHz. For frequencies above 1 GHz, any suitable measuring distance may be used. The equipment size (excluding the antenna) shall be less than 20 % of the measuring distance.

Sufficient precautions shall be taken to ensure that reflections from extraneous objects adjacent to the site do not degrade the measurement results, in particular:

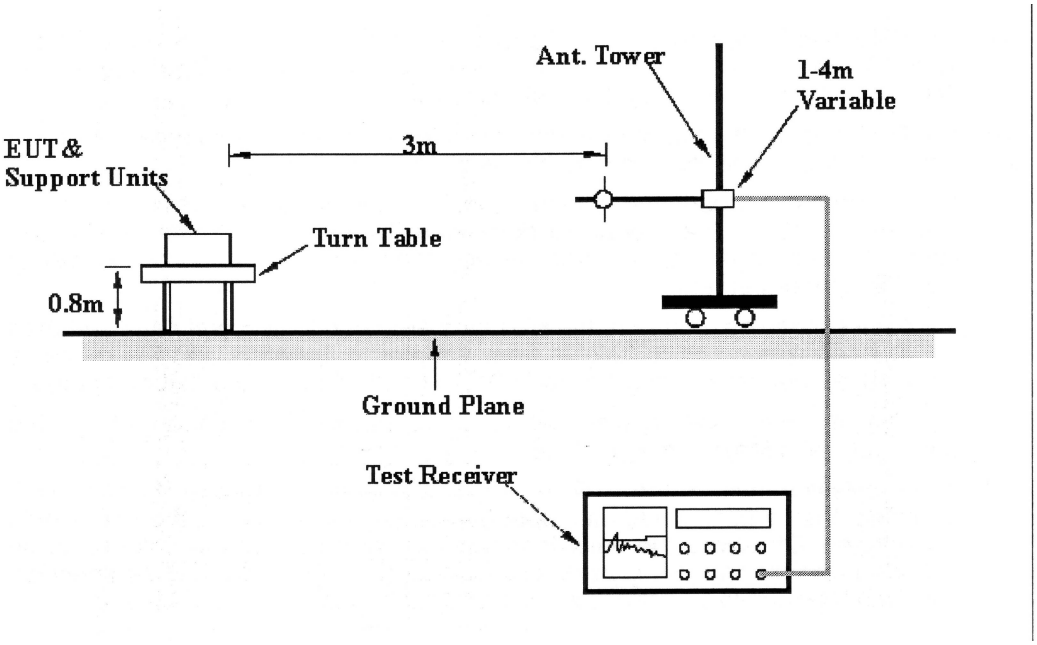
- no extraneous conducting objects having any dimension in excess of a quarter wavelength of the highest frequency tested shall be in the immediate vicinity of the site;

- all cables shall be as short as possible; as much of the cables as possible shall be on the ground plane or preferably below; and the low impedance cables shall be screened.

The EUT shall be placed upon a non-conductive table 0.8 meters above the ground plane and shall be placed in the "worst case" transmitting mode. The EUT shall be rotated 360 degrees to find the azimuth maxima. The receive antenna shall then be raised and lowered between 1 to 4 meters to find the maximum signal emanating from the EUT. This signal strength is then recorded on the data sheets.

Frequency (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measurement Distance (meters)
.0009 - 0.490	2400/F(kHz)	$20*(Log_{10}(2400/F(kHz))$	300
0.490 - 1.705	24000/F(kHz)	$20*(Log_{10}(24000/F(kHz))$	30
1.705 - 30.0	30	29.5	30
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	See requirements of 15.509		

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**Radiated Emissions** (Spurious)	
DNB Job Number:	56071	Date: 23 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.209 [X] RSS-220 3.4
Model Number:	CS710		
Description:	Snow Depth Sensor		
	Test Set Up		



1100 E Chalk Creek Road
Coalville, UT 84017
(435) 336-4433
FAX (435) 336-4436

Radiated Emissions

DNB Job Number:	56071	Date: 23 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (a)
Model Number:	CS710		[X] RSS-220 3.4
Description:	Snow Depth Sensor		
	Equipment List		

Test Equipment List

Description	Mfr / Model	Asset	S/N	Cal Due Date
Amplifier	HP/8447D	U-065	2727A06180	1-Jan-16
Bicon Antenna	SCH/BBA9106	U-186	7	15-May-15
Log P Antenna	SCH/UHAL09107	U-010	10	10-Sep-15
Horn Antenna, Double Rdg GD	AH Systems/SAS-571	U-071	417	11-Jun-15
Spectrum Analyzer	Agilent/E7401A	U-257	MY42000103	8-Jan-16
Spectrum Analyzer	R&S/FSV30	U-248	101367	18-Jun-16
TILE Software	ETS- Lindgern/ 3.4.11.13	U-317	8112006	13-Oct-15

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**Radiated Emissions** (General)	
DNB Job Number:	56071	Date: 23 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.209 [X] RSS-220 3.4
Model Number:	CS710		
Description:	Transceiver for use with Icon products		
Test Set Up - Bicon - Horizontal			

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**Radiated Emissions** (General)	
DNB Job Number:	56071	Date: 23 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.209 [X] RSS-220 3.4
Model Number:	CS710		
Description:	Transceiver for use with Icon products		
Test Set Up - Log Periodic - Horizontal			

1100 E Chalk Creek Road
Coalville, UT 84017
(435) 336-4433
FAX (435) 336-4436

Radiated Emissions (General)

DNB Job Number:	56071	Date: 23 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.209
Model Number:	CS710		[X] RSS-220 3.4
Description:	Snow Depth Sensor		

EUT is in conformance with FCC 15.209	X	YES		NO	Signed	*Y Staples*

FREQ (Mhz)	Meter	Correction Factors (dB)			dBuV/m			Positions			
		Ant	Cbl	Amp	Corr	Lim	Delta	Typ	Tbl	Pl	Hgt
144.033	43.83	14.10	2.40	26.30	34.03	43.50	-9.47	QP	357	Horz	4.00
192.031	42.39	17.60	2.80	25.90	36.89	43.50	-6.61	QP	42	Horz	4.00
216.032	41.15	16.60	2.80	26.00	34.55	46.00	-11.45	QP	209	Horz	4.00
263.942	28.71	18.60	3.40	25.80	24.91	46.00	-21.09	QP	96	Horz	4.00
360.038	49.40	17.50	4.10	26.30	44.70	46.00	-1.30	QP	256	Horz	3.41
372.465	30.66	17.50	4.20	26.40	25.96	46.00	-20.04	QP	297	Horz	4.00
384.035	45.72	17.50	4.20	26.50	40.92	46.00	-5.08	QP	298	Horz	4.00
556.793	33.75	20.70	5.40	27.30	32.55	46.00	-13.45	QP	271	Horz	4.00
576.035	39.00	21.00	5.40	27.40	38.00	46.00	-8.00	QP	75	Horz	4.00
622.326	27.16	22.20	5.70	27.40	27.66	46.00	-18.34	QP	42	Horz	4.00
640.267	31.47	22.80	5.80	27.40	32.67	46.00	-13.33	QP	288	Horz	4.00
685.079	25.92	24.30	6.10	27.50	28.82	46.00	-17.18	QP	265	Horz	4.00
835.322	26.55	23.80	7.00	27.50	29.85	46.00	-16.15	QP	270	Horz	3.89
888.051	30.86	24.10	7.60	27.40	35.16	46.00	-10.84	QP	307	Horz	3.36
960.050	31.99	24.70	7.80	27.00	37.49	54.00	-16.51	QP	276	Horz	4.00
32.040	34.76	18.00	1.40	26.50	27.66	40.00	-12.34	QP	136	Vert	1.00
144.008	47.70	14.10	2.40	26.30	37.90	43.50	-5.60	QP	53	Vert	1.00
192.040	44.45	17.60	2.80	25.90	38.95	43.50	-4.55	QP	337	Vert	1.00
216.031	40.31	16.60	2.80	26.00	33.71	46.00	-12.29	QP	193	Vert	1.00
360.042	44.78	17.50	4.10	26.30	40.08	46.00	-5.92	QP	108	Vert	1.00
384.046	44.95	17.50	4.20	26.50	40.15	46.00	-5.85	QP	126	Vert	1.00
552.080	31.50	20.60	5.40	27.30	30.20	46.00	-15.80	QP	22	Vert	1.00
576.040	43.58	21.00	5.40	27.40	42.58	46.00	-3.42	QP	204	Vert	1.00
640.813	25.77	22.80	5.80	27.40	26.97	46.00	-19.03	QP	89	Vert	1.00
657.950	27.83	23.40	5.90	27.50	29.63	46.00	-16.37	QP	80	Vert	1.00
714.197	23.95	24.60	6.20	27.50	27.25	46.00	-18.75	QP	253	Vert	1.00
748.525	26.01	24.20	6.30	27.50	29.01	46.00	-16.99	QP	98	Vert	1.00
864.047	24.50	24.00	7.30	27.40	28.40	46.00	-17.60	QP	155	Vert	1.00

15.509a [RSS-220 6.2.1a] UWB Bandwidth

The UWB bandwidth of an imaging system operating under the provisions of this section must be below 10.6 Ghz.

UWB bandwidth. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L. The frequency at which the highest radiated emission occurs is designated f_M.

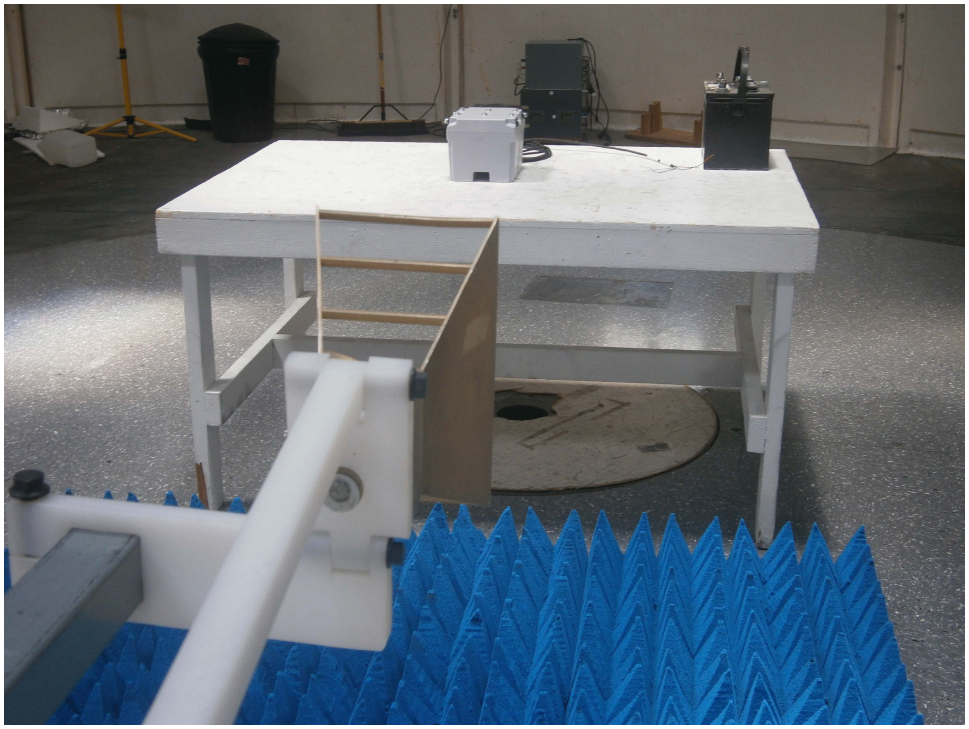
COMPLIANT - Data Below

Measurement Data		
Item	**Description**	**GHz**
f_M	The emission peak	3.453900
f_L	10dB below the highest peak	1.021750
f_H	10dB above the highest peak	6.448570
f_C	Calculated : $(f_H + f_L) / 2$	3.735160
Bandwdth	Calculated : $(f_H - f_L)$	5.426820
Fractional BW	Calculated : $2 * (f_H - f_L) / (f_H + f_L)$	1.452902

F_H is below 10.6 Ghz.

Note: The Fraction Bandwidth is greater than 0.2 and therefore the minimum UWB Bandwidth of 500 MHz requirement does not need to be met.

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**UWB Bandwidth**	
DNB Job Number:	56071	Date: 22 Jun 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (a) [X] RSS-2206.2.1a
Model Number:	CS710		
Description:	Snow Depth Sensor		
	Test Set Up		



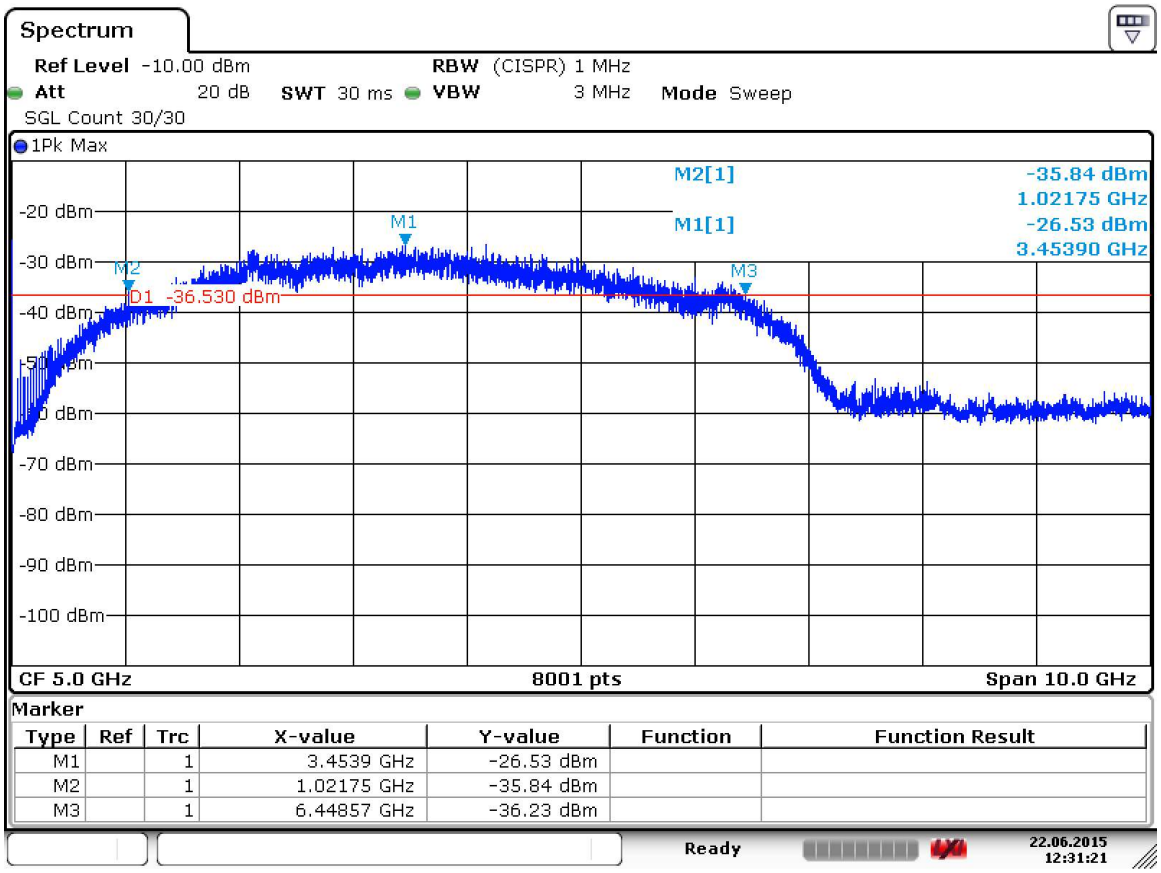
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**UWB Bandwidth**

DNB Job Number:	56071	Date:	22 Jun 2015	Specification
Customer:	Campbell Scientific.			[X] 15.509 (a) [X] RSS-2206.2.1a
Model Number:	CS710			
Description:	Snow Depth Sensor			
	Equipment List			

Test Equipment List

Description	Mfr / Model	Asset	S/N	Cal Due Date
Horn Antenna, Double Rdg GD	AH Systems/SAS 200/751	U-156	222	23-Apr-16
Spectrum Analyzer	R&S/FSV30	U-248	101367	18-Jun-16
TILE Software	ETS- Lindgern/ 3.4.11.13	U-317	8112006	13-Oct-15

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**UWB Bandwidth**	
DNB Job Number:	56071	Date: 22 Jun 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (a) [X] RSS-2206.2.1a
Model Number:	CS710		
Description:	Snow Depth Sensor		



Date: 22.JUN.2015 12:31:21

15.509b [RSS-220 6] Operational Requirements

Requirement: Operation under the provisions of this section is limited to GPRs and wall imaging systems operated for purposes associated with law enforcement, fire fighting, emergency rescue, scientific research, commercial mining, or construction.

(1) Parties operating this equipment must be eligible for licensing under the provisions of part 90 of this chapter.

(2) The operation of imaging systems under this section requires coordination, as detailed in §15.525.

The following excerpt from the CS710 manual page A-1:

Operation of this device is limited to purposes associated with law enforcement, firefighting, emergency rescue, scientific research, commercial mining, or construction. Parties operating this equipment must be eligible for licensing under the provisions of Part 90 of this chapter.

When being used in a mobile application under a snowcat, it is implied that this is for the construction of a ski slope and is being used within the regulations of part 15 of the FCC.

Result: Compliant

15.509c [RSS-220 6.2c] Hand-Held / Wall Imaging Systems

Requirement: A GPR that is designed to be operated while being hand held and a wall imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

Remarks: This device is not a hand-held device nor a wall imaging system. It is intended to be located in the lower cavity of a snow cat beneath the operators cab and directed towards the ground only.

Results: Not Applicable

15.509d [RSS-220 6.1d] Spurious Radiated Emissions
15.509e [RSS-220 6.1e] Spurious Radiated Emissions

The EUT was measured on an open area test site (OATS).

The EUT shall be set up and operated in a similar manner as referenced in Radiated Emissions (General Provisions) [RSS-220 3.4], on page 13 of this report.

Radiated emissions at or below 960 MHz shall not exceed the emission levels in Section 15.209, this data has been recorded previously under Radiated Emissions (General).

Radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

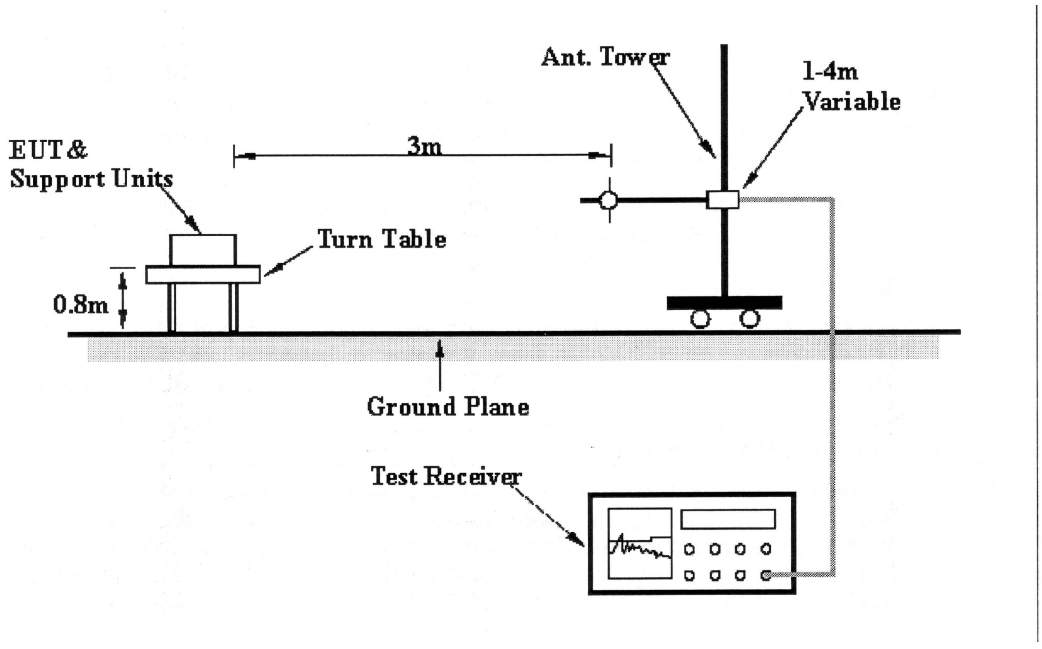
Limits Per 15.509 (d)		
Frequency in MHz	**EIRP (dBm)**	**Field Strength @ 3 meters (dBuV/m)**
960 - 1610	-65.3	29.93
1610 - 1990	-53.3	41.93
1990 - 3100	-51.3	43.93
3100 - 10600	-41.3	53.93
Above 10600	-51.3	43.93

In addition to the radiate emission limits specified in the table above, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz.

Limits Per 15.509 (e)		
Frequency in MHz	**EIRP (dBm)**	**Field Strength @ 3 meters (dBuV/m)**
1164 - 1240	-75.3	19.93
1559 - 1610	-75.3	19.93

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**Spurious Emissions**	
DNB Job Number:	56071	Date: 22 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (d) [X] 15.509 (e) [X] RSS-220 6.1d [X] RSS-220 6.1e
Model Number:	CS710		
Description:	Snow Depth Sensor		
	Test Set Up		

Note: Antenna mast has been adapted to provide "bore-sight" antenna measurements above 1 GHz this fulfills the requirement of keeping the antenna within the cone of radiation and pointed at the area of the device under test.



1100 E Chalk Creek Road
Coalville, UT 84017
(435) 336-4433
FAX (435) 336-4436

Spurious Emissions

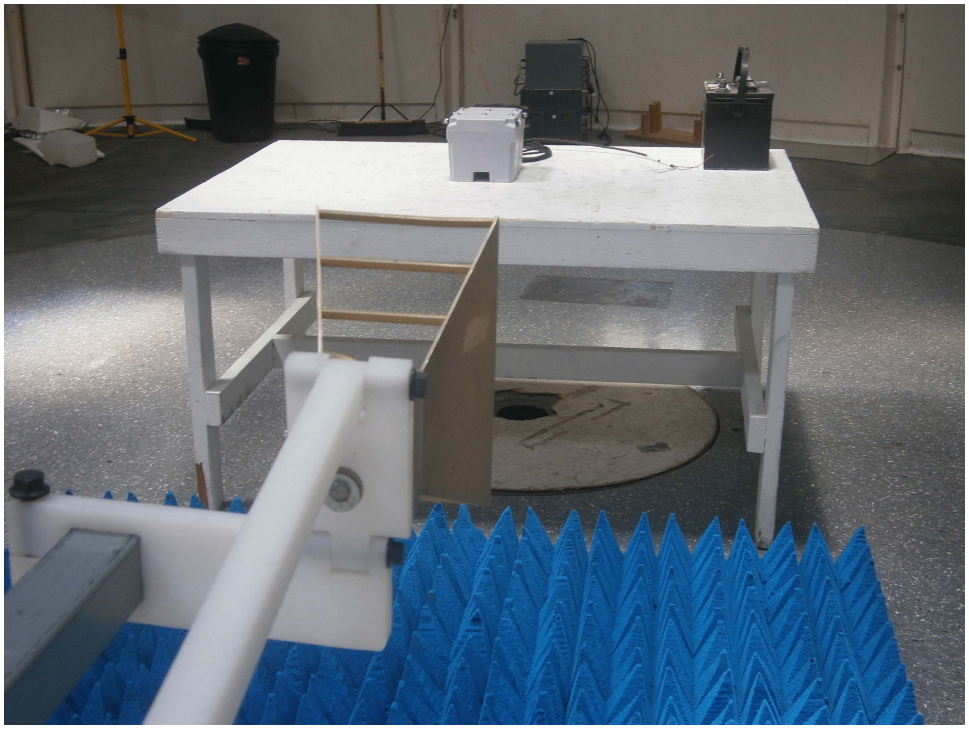
DNB Job Number:	56071	Date:	22 Apr 2015	Specification
Customer:	Campbell Scientific.			[X] 15.509 (d)
Model Number:	CS710			[X] 15.509 (e)
Description:	Snow Depth Sensor			[X] RSS-220 6.1d
	Equipment List			[X] RSS-220 6.1e

Test Equipment List

Description	Mfr / Model	Asset	S/N	Cal Due Date
Amplifier	HP/8447D	U-065	2727A06180	1-Jan-16
Amplifier	DNB / S-21G	U-095	U-095-1	31 Oct 2015
Log P Antenna	SCH/UHAL09107	U-010	10	10-Sep-15
Horn Antenna, Double Rdg GD	AH Systems/SAS-571	U-071	417	11-Jun-15
Spectrum Analyzer	R&S/FSV30	U-248	101367	18-Jun-16
TILE Software	ETS- Lindgern/ 3.4.11.13	U-317	8112006	13-Oct-15

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**Spurious Emissions**	
DNB Job Number:	56071	Date: 22 Apr 2015	Specification [X] 15.509 (d) [X] 15.509 (e) [X] RSS-220 6.1d [X] RSS-220 6.1e
Customer:	Campbell Scientific.		
Model Number:	CS710		
Description:	Transceiver for use with Icon products		
Test Set Up - Log Periodic - Horizontal			

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**Spurious Emissions**	
DNB Job Number:	56071	Date: 22 Apr 2015	Specification [X] 15.509 (d) [X] 15.509 (e) [X] RSS-220 6.1d [X] RSS-220 6.1e
Customer:	Campbell Scientific.		
Model Number:	CS710		
Description:	Transceiver for use with Icon products		
Test Set Up - DRG Horn - Horizontal			



1100 E Chalk Creek Road
Coalville, UT 84017
(435) 336-4433
FAX (435) 336-4436

Spurious Emissions

DNB Job Number:	56071	Date: 19 Jan 2016	Specification
Customer:	Campbell Scientific.		[X] 15.509 (d)
Model Number:	CS710		[X] RSS-220 6.1d
Description:	Snow Depth Sensor		

EUT is in conformance with FCC 15.509 (d)	X	YES		NO	Signed	*CL Payne*

FREQ (Mhz)	Meter	Correction Factors (dB)			dBuV/m			Positions			
		Ant	Cbl	Amp	Corr	Lim	Delta	Typ	Tbl	Pl	Hgt
12272.530	13.0	40.5	11.8	28.5	36.7	44.0	-7.3	AVE	180	Hor	1.00
12859.830	13.4	41.4	13.4	31.7	36.4	44.0	-7.6	AVE	270	Hor	1.00
12231.780	12.9	40.3	11.7	28.5	36.4	44.0	-7.6	AVE	90	Hor	1.00
12206.660	13.0	40.3	11.6	28.5	36.3	44.0	-7.7	AVE	0	Hor	1.00
11812.340	12.8	39.6	10.2	28.6	34.0	44.0	-10.0	AVE	270	Hor	1.00
13324.020	13.3	40.9	13.5	34.4	33.2	44.0	-10.8	AVE	90	Hor	1.00
11639.480	12.9	39.6	9.3	28.6	33.2	44.0	-10.8	AVE	90	Hor	1.00
11741.970	12.2	39.6	9.8	28.6	33.0	44.0	-11.0	AVE	180	Hor	1.00
17459.630	14.1	43.1	16.2	40.4	33.0	44.0	-11.0	AVE	90	Hor	1.00
11640.980	12.5	39.6	9.3	28.6	32.8	44.0	-11.2	AVE	0	Hor	1.00
17655.480	13.8	43.5	15.6	40.4	32.5	44.0	-11.5	AVE	270	Hor	1.00
17184.540	14.3	42.7	15.4	40.3	32.1	44.0	-11.9	AVE	0	Hor	1.00
17193.410	14.2	42.7	15.4	40.3	32.0	44.0	-12.0	AVE	180	Hor	1.00
13689.850	12.5	40.7	13.0	36.5	29.8	44.0	-14.2	AVE	180	Hor	1.00
13762.470	12.5	40.8	12.9	36.9	29.3	44.0	-14.7	AVE	270	Hor	1.00
16657.980	13.6	41.5	13.9	39.8	29.2	44.0	-14.8	AVE	0	Hor	1.00
16630.610	13.6	41.4	13.9	39.8	29.1	44.0	-14.9	AVE	180	Hor	1.00
14902.320	13.6	42.2	13.2	40.0	28.9	44.0	-15.1	AVE	0	Hor	1.00
16653.480	13.2	41.5	13.9	39.8	28.8	44.0	-15.2	AVE	270	Hor	1.00
14366.770	13.3	41.5	13.4	39.6	28.5	44.0	-15.5	AVE	90	Hor	1.00
13917.570	12.7	41.0	12.7	37.9	28.5	44.0	-15.5	AVE	0	Hor	1.00
14585.490	13.1	41.7	13.6	40.0	28.4	44.0	-15.6	AVE	270	Hor	1.00
14976.190	12.9	42.3	13.1	40.0	28.3	44.0	-15.7	AVE	180	Hor	1.00
16392.010	13.8	40.8	13.1	39.6	28.0	44.0	-16.0	AVE	90	Hor	1.00
15902.450	13.7	39.7	11.4	40.0	24.7	44.0	-19.3	AVE	0	Hor	1.00
15418.390	14.0	39.6	11.3	40.4	24.5	44.0	-19.5	AVE	180	Hor	1.00

Resolution Bandwidth = 1MHz
Video Bandwidth = 3MHz
Detector = RMS Averaging

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Spurious Emissions

DNB Job Number:	56071	Date: 22 Apr 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (e)
Model Number:	CS710		[X] RSS-220 6.1e
Description:	Snow Depth Sensor		

EUT is in conformance with FCC 15.509 (e)	X	YES		NO	Signed	*CL Payne*

FREQ (Mhz)	Meter	Correction Factors (dB)			dBuV/m			Positions			
		Ant	Cbl	Amp	Corr	Lim	Delta	Typ	Tbl	Pl	Hgt
1176.169	35.80	23.70	2.55	49.64	12.40	19.90	-7.50	AVE	0	Vert	1.00
1224.300	34.90	23.86	2.61	49.68	11.70	19.90	-8.20	AVE	0	Vert	1.00
1591.476	38.40	25.46	2.96	49.92	16.90	19.90	-3.00	AVE	0	Vert	1.00

Resolution Bandwidth = 10 kHz
Video Bandwidth = 1MHz
Detector = RMS Averaging

15.509f [RSS-220 6.1g] 50 MHz Bandwidth

The EUT was measured on an open area test site (OATS).

The EUT shall be set up and operated in a similar manner as referenced in Radiated Emissions (General Provisions) [RSS-220 3.4], on page 13 of this report.

For UWB devices where the frequency at which the highest radiated emission occurs, f_M, is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

§15.521 (g) When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, f_M. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using E(dBuV/m) = P(dBm EIRP) + 95.3. If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

For this measurement a resolution bandwidth of 3MHz was used, therefore:

EIRP limit = 20 log (3/50) = -24.44 dBm

Where the maximum measured 3m Field Strength Limit = 64.02 dBuV/m @ 3 meters

The calculated EIRP = 64.02 - 95.3 = - 31.28 EIRP (dBm)

The calculated EIRP (mW) = 0.000744732 mW

Note: Calculation in accordance with ANSI C63.10-2013 clause 10.3.9

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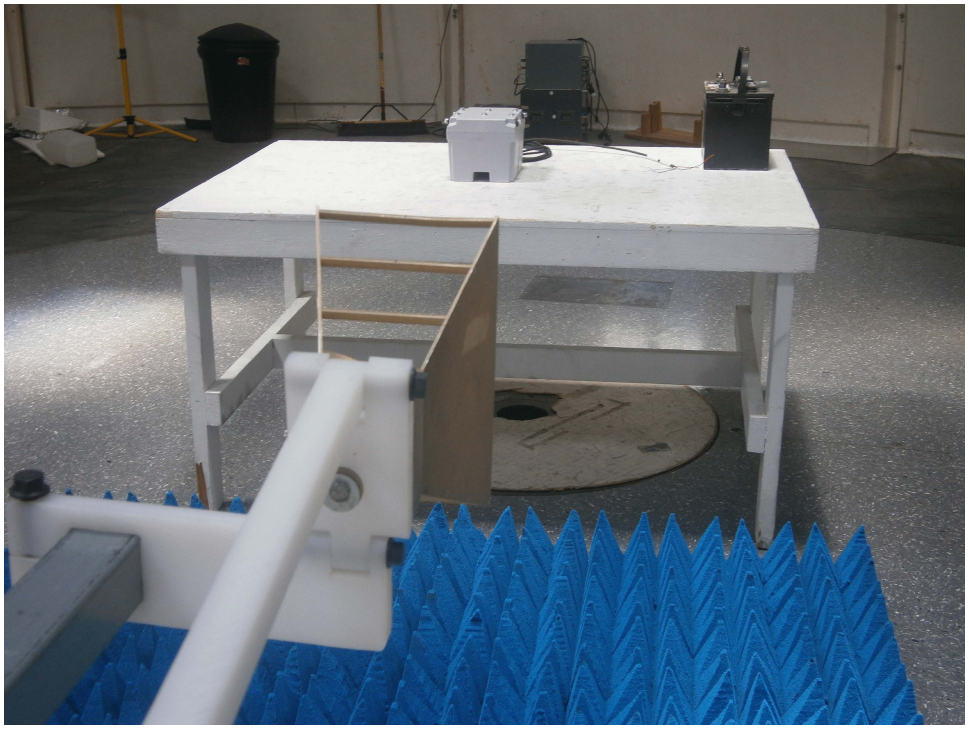
50 MHz Bandwidth

DNB Job Number:	56071	Date:	2 Jul 2015	Specification
Customer:	Campbell Scientific.			[X] 15.509 (f)
Model Number:	CS710			[X] RSS-220 6.1g
Description:	Snow Depth Sensor			
	Equipment List			

Test Equipment List

Description	Mfr / Model	Asset	S/N	Cal Due Date
Amplifier	HP/8447D	U-065	2727A06180	1-Jan-16
Amplifier	DNB / S-21G	U-095	U-095-1	31 Oct 2015
Log P Antenna	SCH/UHAL09107	U-010	10	10-Sep-15
Horn Antenna, Double Rdg GD	AH Systems/SAS-571	U-071	417	11-Jun-15
Spectrum Analyzer	R&S/FSV30	U-248	101367	18-Jun-16
TILE Software	ETS- Lindgern/ 3.4.11.13	U-317	8112006	13-Oct-15

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	**50 MHz Bandwidth**	
DNB Job Number:	56071	Date: 2 Jul 2015	Specification [X] 15.509 (f) [X] RSS-220 6.1g
Customer:	Campbell Scientific.		
Model Number:	CS710		
Description:	Transceiver for use with Icon products		
Test Set Up - DRG Horn - Horizontal			



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50 MHz Bandwidth

DNB Job Number:	56071	Date: 2 Jul 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (f)
Model Number:	CS710		[X] RSS-220 6.1g
Description:	Snow Depth Sensor		
EUT is in conformance with FCC 15.509 (f)	X YES	NO Signed	*CL Payne*

	FREQ (Mhz)	Meter	Correction Factors			dBuV/m			Positions			
			Ant	Cbl	Amp	Corr	Lim	Delta	Typ	Tbl	Pl	Hgt
f_M	3453.900	76.03	31.78	3.39	49.81	61.39	70.80	-9.41	Peak	0	Vert	1.00
f_M	3453.900	71.70	31.78	3.39	49.81	57.06	70.80	-13.74	Peak	0	Hor	1.00
Peak	3481.250	78.13	30.30	3.50	49.80	62.12	70.80	-8.68	Peak	0	Vert	1.00
Peak	4216.250	75.49	31.96	6.19	49.61	64.02	70.80	-6.78	Peak	0	Hor	1.00

Resolution Bandwidth = 3MHz
Video Bandwidth = 10MHz
Detector = Peak

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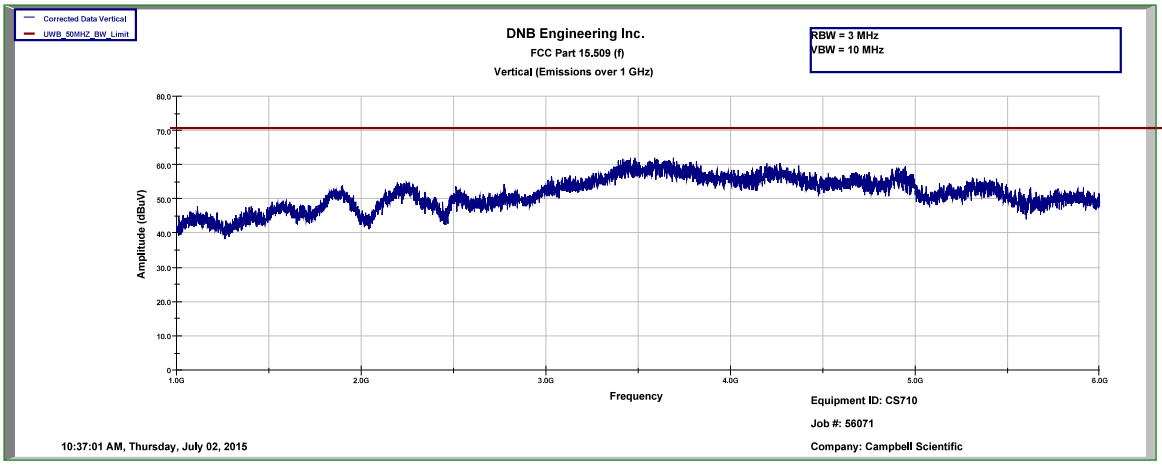
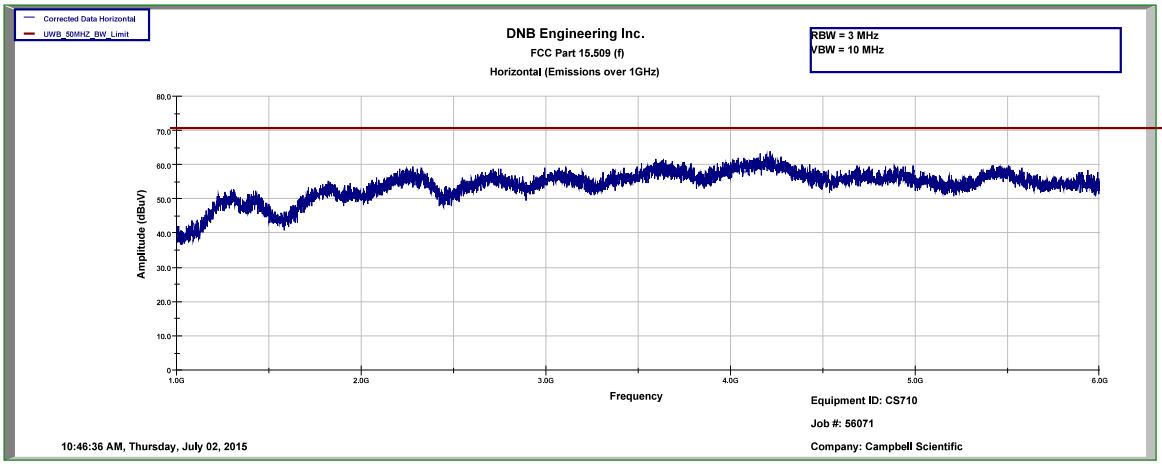
50 MHz Bandwidth

DNB Job Number:	56071	Date: 2 Jul 2015	Specification
Customer:	Campbell Scientific.		[X] 15.509 (f)
Model Number:	CS710		[X] RSS-220 6.1g
Description:	Snow Depth Sensor		





End of Report UT56071A-003