ELECTRONICS TEST CENTRE
MPB TECHNOLOGIES INC.

Test Report Prepared By:

Electronics Test Centre
27 East Lake Hill
Airdrie, Alberta
Canada
T4A 2K3

sales@etc-mpbtech.com
http://www.etc-mpb.com

Telephone: 1-403-912-0037

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EMC testing of the Spyder Controls Corporation Two Position Switch in accordance with FCC Part 15.231, ANSI C63.10-2013.

FCC ID: OV9BSSPWZCR6

Tested by: Imran Akram, Janet Mijares

Prepared for: Spyder Controls Corporation

7102 - 52 St. #10
Lacombe, Alberta
Canada
T4L 1Y9
Telephone: 1-(403) 782-9738

Imran Akram
iakram@etc-mpbtech.com
EMC Technologist
Electronics Test Centre (Airdrie)

Marc Rousseau
marc.rousseau@mpbc.ca
QA Manager
Electronics Test Centre (Airdrie)

REVISION RECORD

ISSUE	DATE	AUTHOR	REVISIONS
DRAFT 1	2020-09-22	I. Akram	Initial draft submitted for review.
DRAFT 2	2020-11-12	I. Akram	Added FCC ID and Serial#
DRAFT3	2020-11-20	I. Akram	Format Change
Release 1	2020-12-02	M. Rousseau	Sign off

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1.0 INTRODUCTION

1.1 Scope

The purpose of this report is to present the results of compliance testing performed in accordance with FCC Part 15.231(e) and ANSI C63.10-2013. All test procedures, limits, criteria, and results described in this report apply only to the Spyder Controls Corporation test sample, referred to herein as the EUT (Equipment Under Test).

The samples have been provided by the customer.

This report does not imply product endorsement by the Electronics Test Centre, A2LA, nor any Canadian Government agency.

1.2 Applicant

This test report has been prepared for Spyder Controls Corporation, located in Lacombe, Alberta, Canada.

1.3 Test Sample Description

As provided to ETC (Airdrie) by Spyder Controls Corporation:

Product Name:	Two Position Switch
Frequency Band	260-470 MHz
Type of Modulation	FSK
Frequency	431.06 MHz, 433.06 MHz
Associated Antenna	Non-Detachable, Loop, -6 dBi
Model #	SSP17-02
Serial #	SSP17-02-TU1
Power:	Internal Battery

The device is a wireless device. It incorporates an internal antenna.

1.4 General Test Conditions and Assumptions

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

The environmental conditions are recorded during each test, and are reported in the relevant sections of this document.

1.5 Scope of Testing

Tests were performed in accordance with FCC Part 15.231(e) and ANSI C63.10-2013.

The EUT was also tested as an unintentional radiator, as reported separately.

1.5.1 Test Methodology

Test methods are documented in the part of Section 2 of this report associated with each particular Test Case.

1.5.2 Variations in Test Methodology

Any variance in methodology or deviation from the reference Standard is documented in the part of Section 2 of this report associated with each particular Test Case.

1.5.3 Test Sample Verification, Configuration & Modifications

EUT setup, configuration, protocols for operation and monitoring of EUT functions, and any modifications performed in order to meet the requirements, are detailed in each Test Case of Section 2 of this report.

1.5.4 Uncertainty of Measurement:

The factors contributing to uncertainty of measurement are identified and calculated in accordance with CISPR 16-4.

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Uncertainty
Radiated Emissions Level (30 MHz – 1 GHz)	±5.8 dB
Radiated Emissions Level (1 GHz – 18 GHz)	±4.9 dB

2.0 TEST CONCLUSION

STATEMENT OF COMPLIANCE

The customer equipment referred to in this report was found to comply with the requirements, as summarized below.

The measurement uncertainty is not accounted for determination of the statement of compliance. The statement of compliance is based only on the measurement value recorded.

The EUT was subjected to the following tests. Compliance status is reported as **Compliant** or **Non-compliant**. **N/A** indicates the test was Not Applicable to the EUT.

Note: Maintenance of compliance is the responsibility of the Manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the EUT with respect to the standards detailed in this test report.

The following table summarizes the tests performed in terms of the specification, class or performance criterion applied, and the EUT modification state.

Test Case	Test Type	Specification	Test Sample	Mods	Config.	Result
2.1	AC Conducted Emissions	FCC Part 15.207(a)	Two Position Switch	none	see § 2.1	**N/A**
2.2	Duty Cycle	ANSI C63.10 FCC part15.35(c)	Two Position Switch	none	see § 2.3	**Compliant**
2.3	Occupied Bandwidth	ANSI C63.10 FCC part 15.231(c)	Two Position Switch	none	see § 2.4	**Compliant**
2.4	Transmission Time	FCC Part 15.231(e)	Two Position Switch	none	see § 25	**Compliant**
2.5	EUT Position	ANSI C63.10	Two Position Switch	none	see § 2.6	**Compliant**
2.6	Tx Radiated Emissions	FCC Part 15.231(e), FCC15.209, FCC 15.205	Two Position Switch	none	see § 2.7	**Compliant**
2.7	RF Exposure	FCC Part 1.1307(b)(1), KDB 447798	Two Position Switch	none	N/A	**Compliant**

Refer to the test data for applicable test conditions.

2.1 AC Power Line Conducted Emissions: Transmit Mode

Test Lab: Electronics Test Centre, Airdrie	**EUT: Two Position Switch**
Test Personnel:	**Standard: FCC Part 15.207**
Date:	**Basic Standard: ANSI C63.10-2013**

EUT status: N/A

Comments: The device is only powered by an internal battery, or a vehicle DC supply. There is no connection to the AC mains

2.2 Channel Occupied Bandwidth

Test Lab: Electronics Test Centre, Airdrie	**EUT: Two Position Switch**
Test Personnel: Imran Akram	**Standard: FCC PART 15.231**
Date: 2020-09-16 (24.1° C, 37.4% RH)	**Basic Standard: ANSI C63.10: 2013**

EUT status: Compliant

Specification: FCC Part 15.231(c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

2.2.1 Test Methodology: ANSI C63.10:2013

This measurement is performed with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. If the EUT antenna is integral to the device, an antenna is placed to capture the transmitted signals.

The spectrum analyzer is set for a frequency span selected to clearly display the channel. The RBW is set ≥ 1% of the 20 dB BW. The Peak detector is used, with the trace set to Max Hold.

The automated 99% BW function of the spectrum analyzer is engaged, and the 20 dB OBW is measured with the x dB function.

2.2.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.2.3 Test Equipment

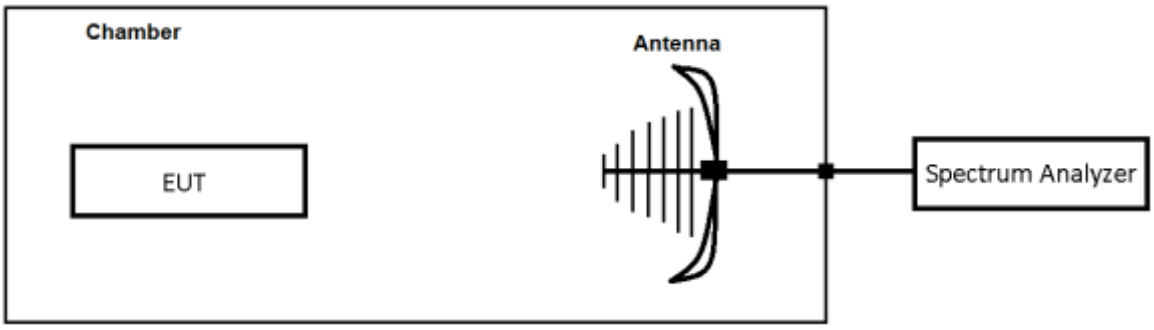
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS 01102006	4419	2020-01-03	2021-01-03

2.2.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously by programming to simulate the continuous press on the button. The output was modulated as in normal operation. The EUT met the requirements without modification.

EUT configuration for Occupied Bandwidth testing:

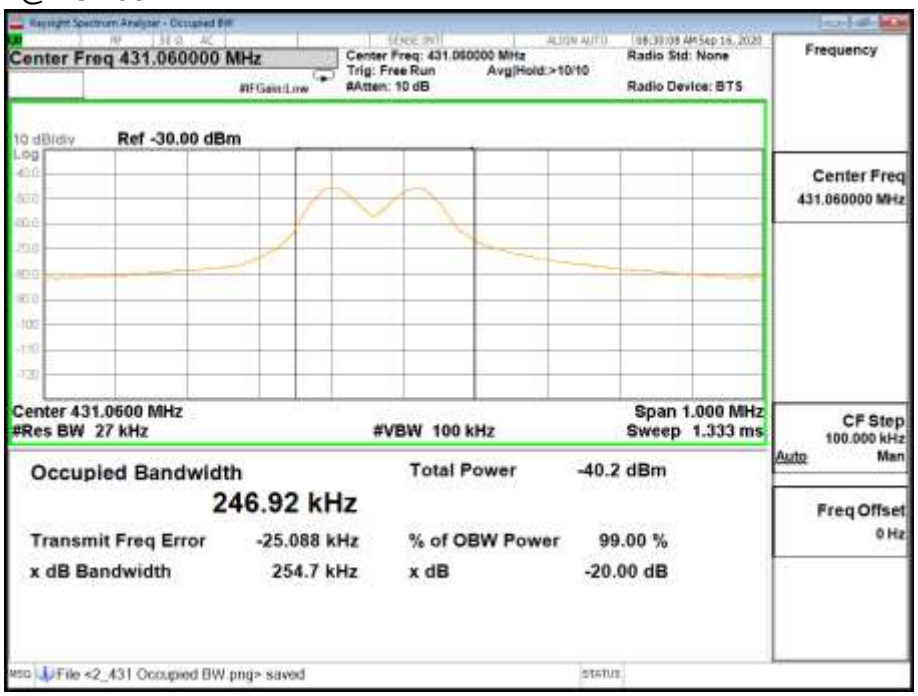


2.2.5 Summary of test Results / Plots:

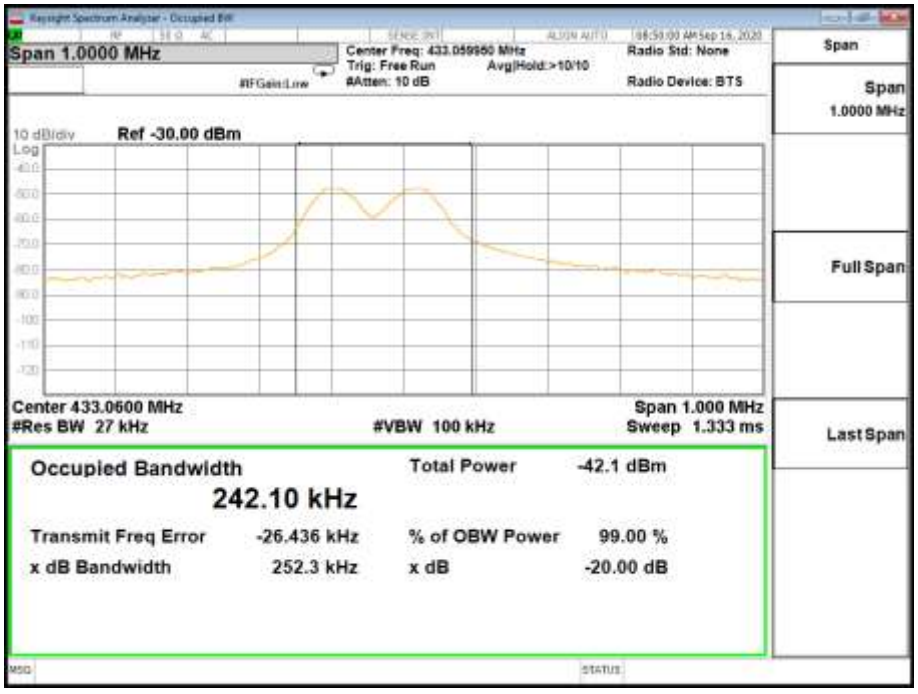
Carrier Frequency [MHz]	Maximum Limit 20 dB OBW [MHz]	Measured 20 dB OBW [MHz]	Margin [MHz]
431.06	1.08	0.2547	0.8253
433.06	1.08	0.2523	0.8277

Screen Captures from the spectrum analyzer:

20dB BW @ 431.06 MHz:



20dB BW @ 433.06 MHz:



2.3 Duty Cycle Correction Factor

Test Lab: Electronics Test Centre, Airdrie	**EUT: Two Position Switch**
Test Personnel: Imran Akram	**Standard: FCC Part 15.231**
Date: 2020-09-19 (21.9° C, 45.1% RH)	**Basic Standard: ANSI C63.10-2013**
EUT status: Compliant	

Specification:

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal

§15.35(c), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds

2.3.1 Test Methodology: ANSI C63.10:2013

This measurement is performed with modulation.

Set the spectrum analyzer to Zero-Span (time domain), centered on the channel frequency. Adjust the sweep time to clearly capture the transmitted signal. Set the RBW to ≥100 kHz. Set the VBW to 3* RBW. Use the Peak detector. Use the Marker functions to measure the 'on time' of the transmitter. This may require adding up the pulses within the Tx burst. Capture a 100 ms time span to determine the Duty Cycle.

2.3.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.3.3 Test Equipment

Testing was performed with this equipment:

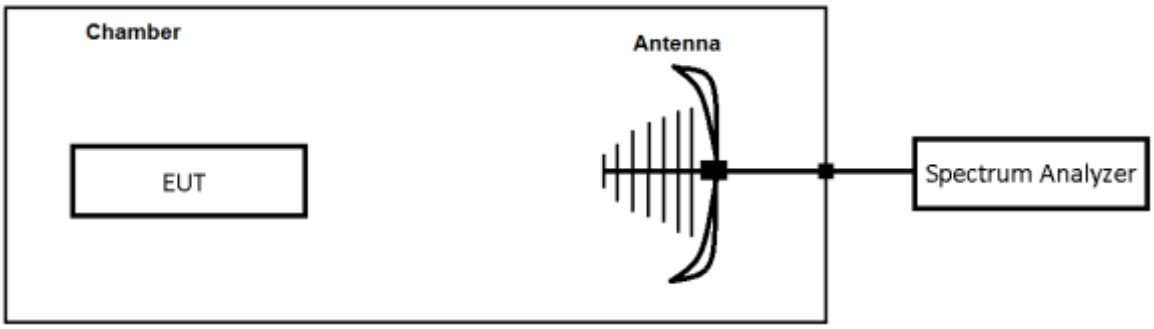
Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS 01102006	4419	2020-01-03	2021-01-03

2.3.4 Test Sample Verification, Configuration & Modifications

The EUT does not support continuous transmission, voice, video or the remote control of toys. The EUT sends a control signal to trigger a display function in response to a button being pressed by the operator. The EUT transmission was manually initiated.

The EUT met the requirements without modification.

EUT configuration for Periodic Operation testing:



2.3.5 Summary of test Results / Plots:

Duty Cycle Calculation

The Duty Cycle is defined as the ratio of the 'On' time during a 100 ms interval.

Duty Cycle = (Pulse Length in ms) / 100

The Duty Cycle Correction Factor is determined according to the following equation:

@ 431.06 MHz, Duty Cycle Correction Factor (dB) = 20 * $\log_{10}$(Duty Cycle)

Pulse Width: 123.7µs + 5.034ms = 5.16ms

Total ON time = 5.16 x 2 = 10.32

Duty Cycle = 10.32 / 100 = 0.103

DCCF = 20 * $\log_{10}$(0.103) = **-19.74 dB**

@ 433.06 MHz, Duty Cycle Correction Factor (dB) = 20 * $\log_{10}$(Duty Cycle)

Pulse Width: 113.3µs + 5.040ms = 5.153ms

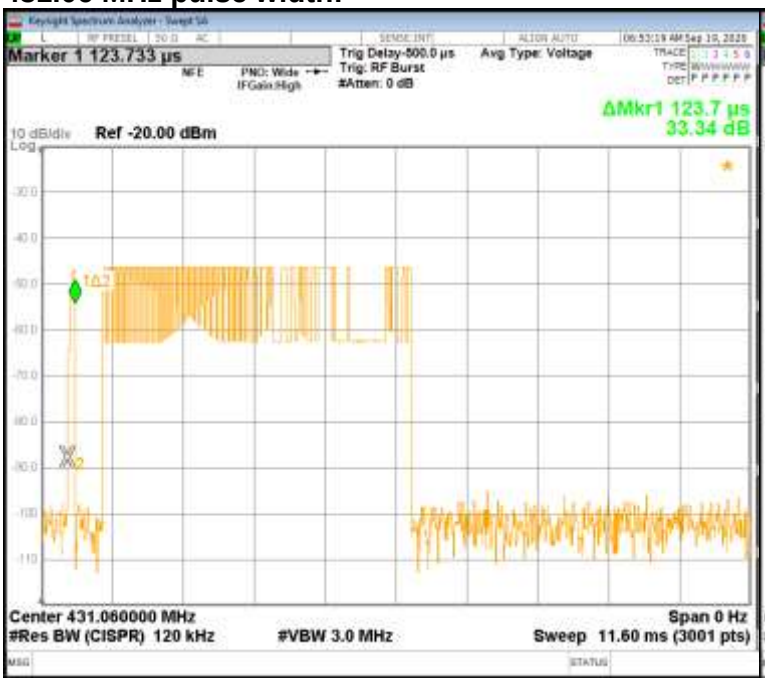
Total ON time = 5.15 x 2 = 10.30

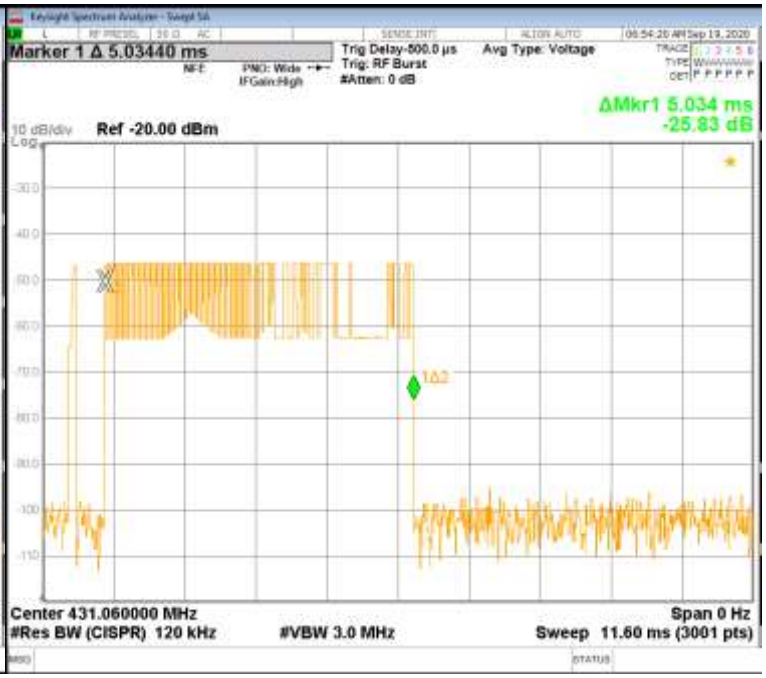
Duty Cycle = 10.30 / 100 = 0.103

DCCF = 20 * $\log_{10}$(0..103) = **-19.74 dB**

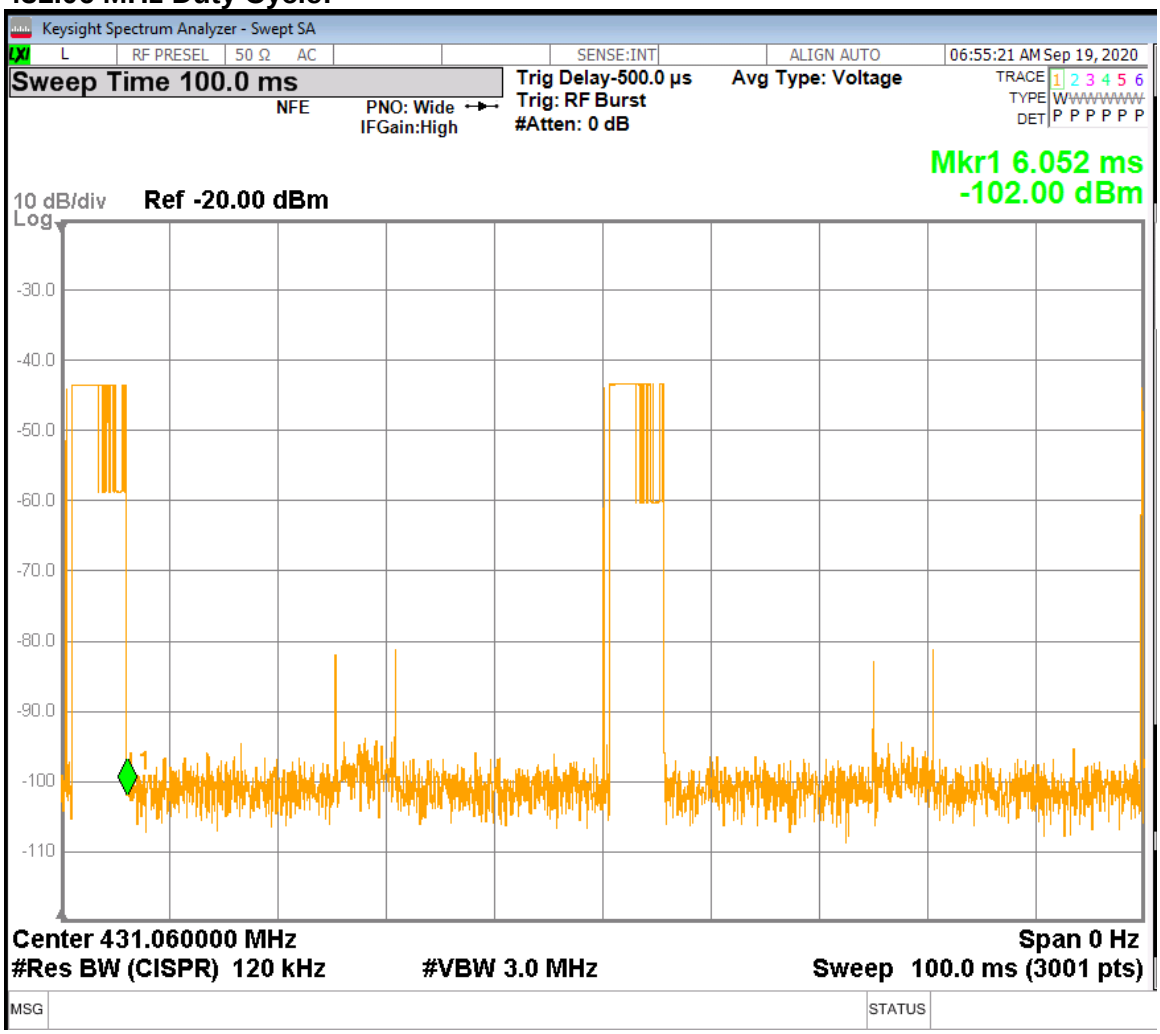
Note: The 100 ms traces show some bleed-through from the adjacent carrier frequency, but at more than 50 dB below the frequency of interest, this was not considered as part of the DCCF calculation.

431.06 MHz pulse width:

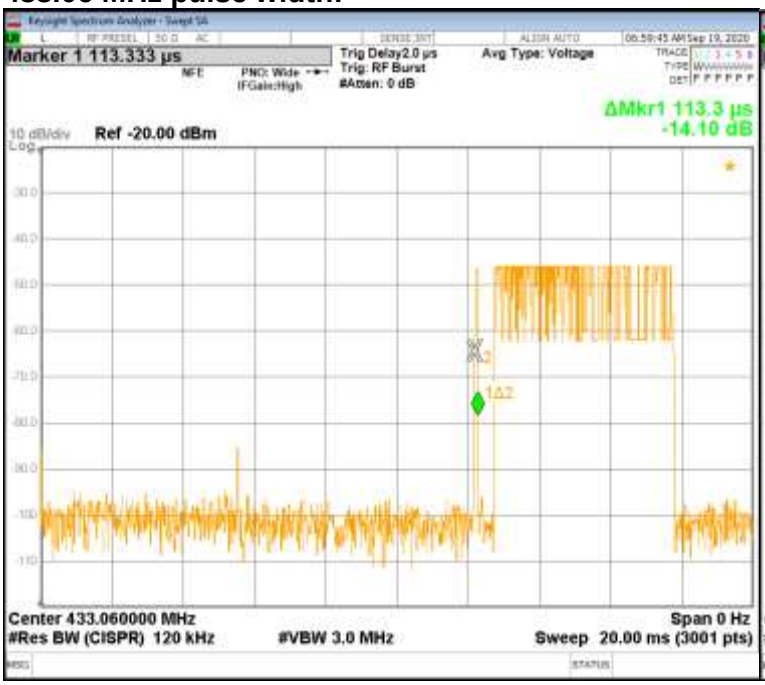


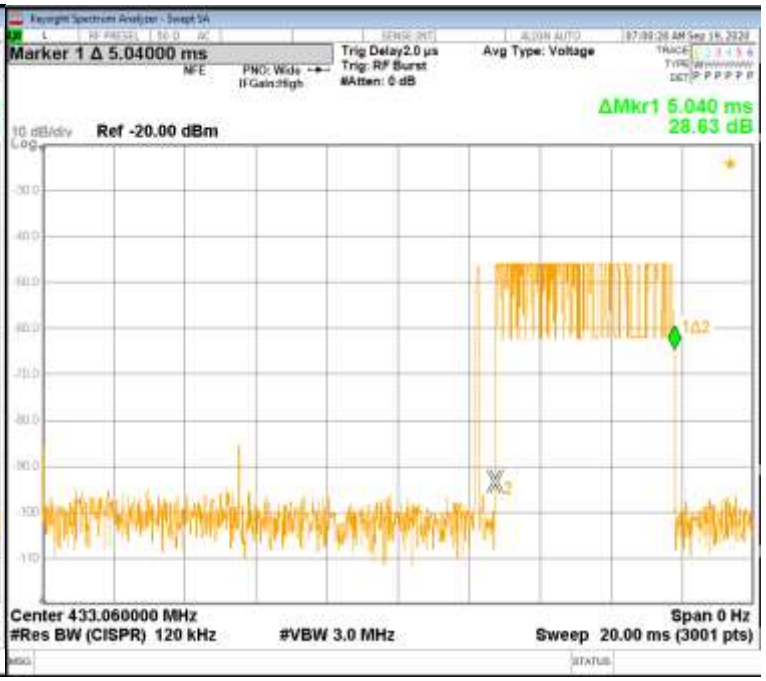


431.06 MHz Duty Cycle:

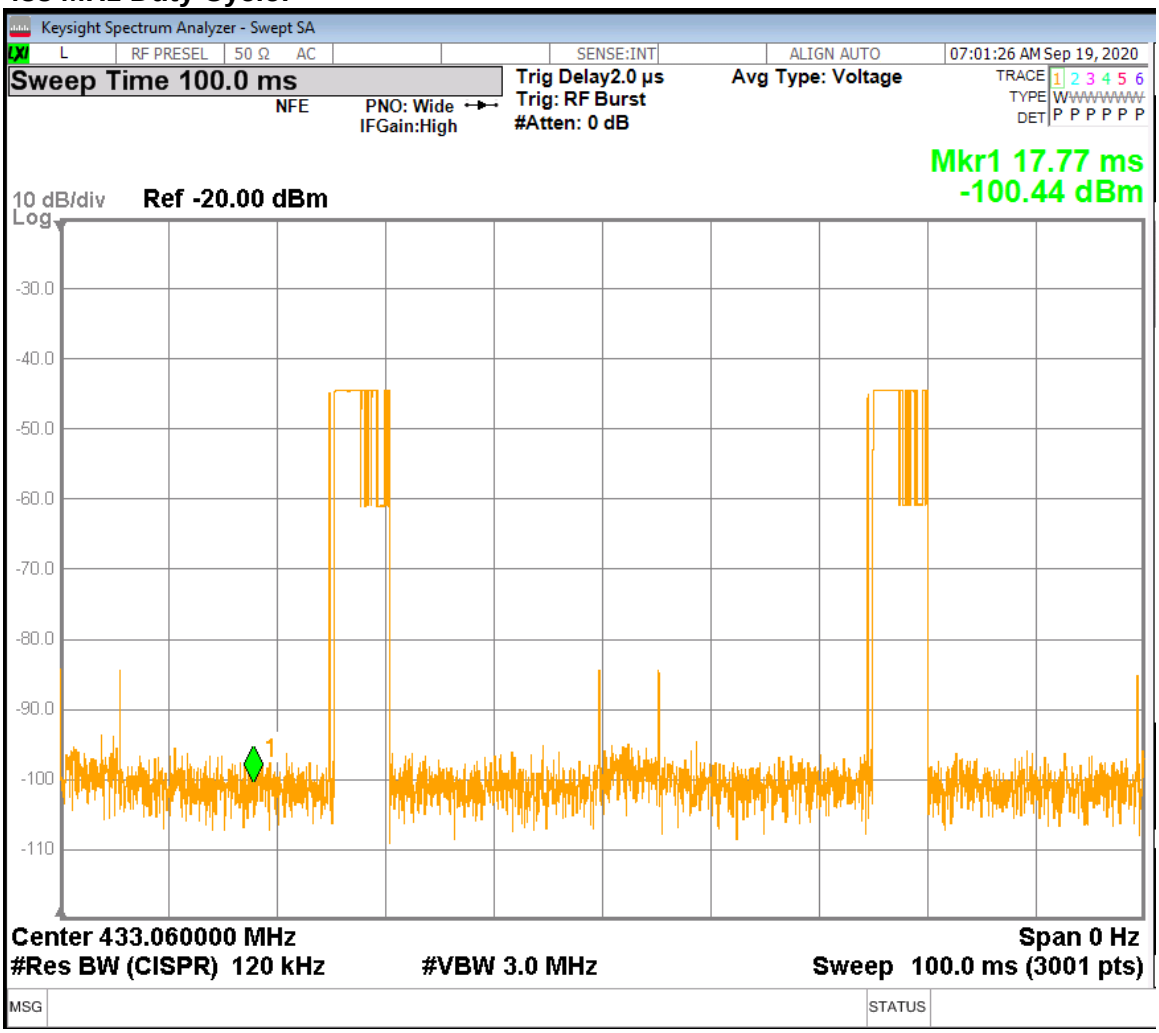


433.06 MHz pulse width:





433 MHz Duty Cycle:



2.4 Transmission Time

Test Lab: Electronics Test Centre, Airdrie	**EUT: Two Position Switch**
Test Personnel: Imran Akram	**Standard: FCC PART 15.231**
Date: 2020-11-18/20 (24.1° C, 37.4% RH)	**Basic Standard: ANSI C63.10: 2013**

EUT status: Compliant

Specification: FCC Part 15.231(e)

According to FCC 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

2.4.1 Test Methodology:

This measurement is performed with modulation.

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency **to** 431.06MHz or 433.06MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

2.4.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.4.3 Test Equipment

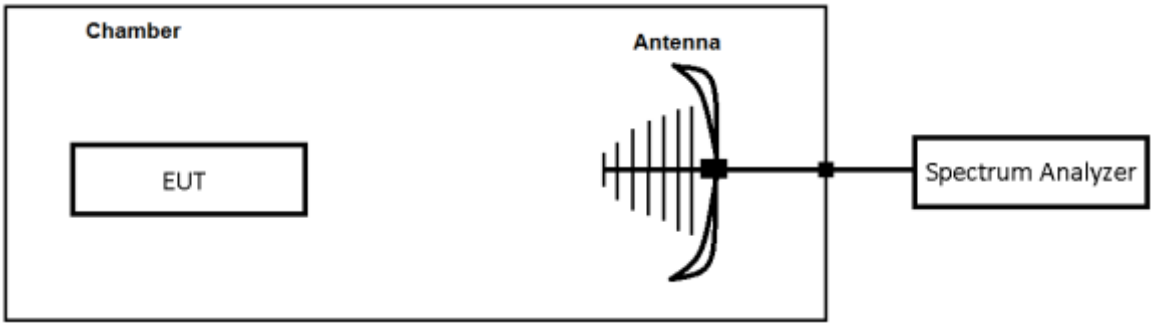
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2020-10-02	2022-10-02
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS 01102006	4419	2020-01-03	2021-01-03

2.5.4 Test Sample Verification, Configuration & Modifications

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 431.06MHz or 433.06MHz

EUT configuration for Occupied Bandwidth testing:

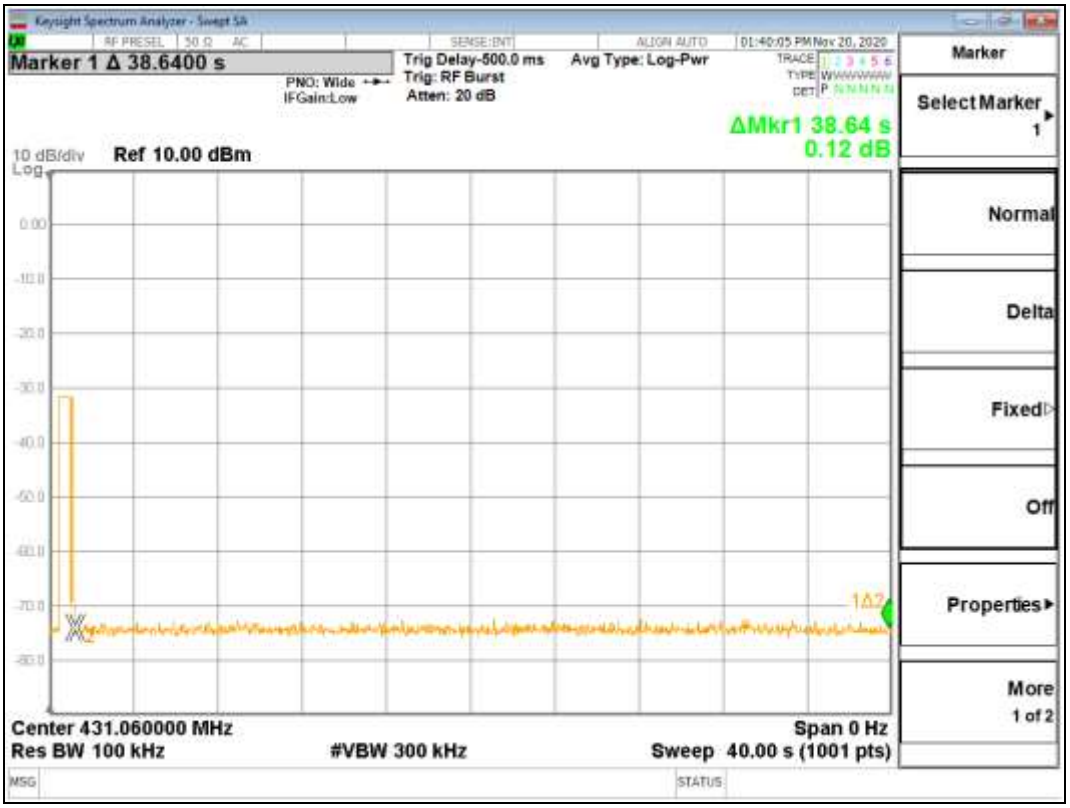


2.4.5 Summary of test Results / Plots:

Item	Measured Value	Limit	Result
Transmission Time	0.760 sec	< 1 sec	Compliant
Silent time	>38.64 Sec	> 10 Sec	Compliant
Silent Time /Transmission Time	> 50.84	> 30	Compliant

Screen Captures from the spectrum analyzer: Transmission time

Screen Captures from the spectrum analyzer: Silent Time



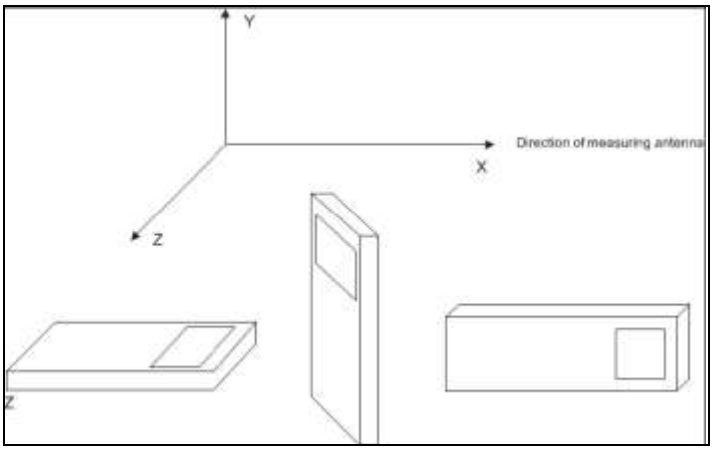
2.5 EUT Positioning Assessment

Test Lab: Electronics Test Centre, Airdrie	**EUT: Two Position Switch**
Test Personnel: Imran Akram	**Standard: FCC Part 15.231**
Date: 2020-09-16 (24.1° C, 37.4% RH)	**Basic Standard: ANSI C63.10-2013**

EUT Worse Axis: Z-Axis

Specification: ANSI C63.10-2013, Clause 6.3.1

EUTs with integral antennas shall be evaluated in their normal orientation. Where EUTs are designed to be installed in one of two orientations (such as wireless access points that can be located horizontally on a table or mounted vertically to the wall), these devices shall be tested in both orientations. EUTs that can be operated in multiple orientations (such as handheld, portable, or modular devices) shall be tested in three orientations. However, in all cases, the antenna shall be adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. For example, a device that is intended to radiate downward in normal operation shall be tested in an orientation that permits the measurement of the maximum level of the downward radiation.



2.5.1 Test Methodology:

The EUT is set to a selected channel with test-specific software. The output is modulated as in normal operation.

Assessment measurements are performed with an antenna appropriate to the carrier frequency. The EUT is placed 80 cm above the ground plane, and the area between the EUT and the antenna mast is covered with RF absorbent material.

The EUT is rotated in azimuth over 360 degrees to find the direction of maximum emission. Antenna height is varied from 1 – 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the Peak detector and recorded.

This process is repeated for all three orthogonal axes of the EUT, in both polarizations.

2.5.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.5.4 Test Equipment

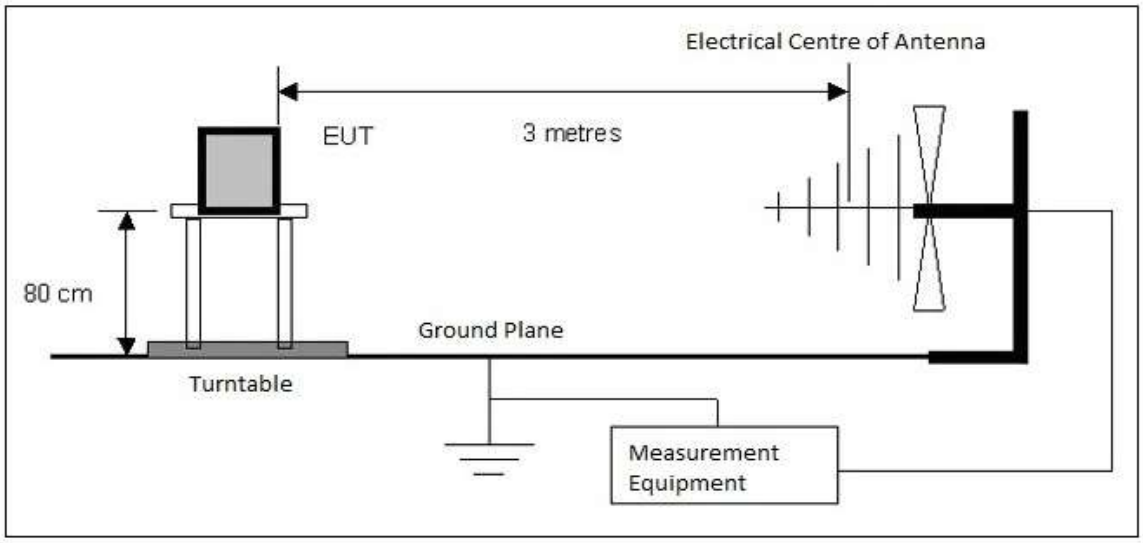
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A	
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS 01102006	4419	2020-01-03	2021-01-03

2.5.5 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously by programming the unit. The output was modulated as in normal operation. The EUT was not modified.

EUT configuration for EUT Positioning:



2.6 Radiated Spurious Emissions

Test Lab: Electronics Test Centre, Airdrie	**EUT: Two Position Switch**
Test Personnel: Imran Akram, Janet Mijares	**Standard: FCC Part 15.231(e)**
Date: 2020-09-16/17 (20.9° C, 43.1% RH)	**Basic Standard: ANSI C63.10-2013**

EUT status: Compliant

Specification: FCC Part 15.231(e)

In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental		Field strength of spurious emissions	
	(µv/m)	(dBµv/m)	(µv/m)	(dBµv/m)
40.66-40.70	1000	60	100	40
70-130	500	53.98	50	33.98
130-174	500 to 1500*	53.98 to 63.52*	50 to 150*	33.98 to 43.52*
174-260	1,500	63.52	150	43.52
260-470	**1,500 to 5,000***	**63.52 to 73.98***	**150 to 500***	**43.52 to 53.98***
Above 470	5,000	73.98	500	53.98

*Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

§15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength		Measurement distance (meters)	
	(µv/m)	(dBµv/m)		
0.009-0.490	2400/F(kHz)	128.5- 93.8	300	3
0.490-1.705	24000/F(kHz)	73.8 – 62.97	30	3
1.705-30.0	30	69.54	30	3
30-88	100**	40	3	3
88-216	150**	43.52	3	3
216-960	200**	46.02	3	3
Above 960	500	53.98	3	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §15.231 and §15.241.

Specification: ANSI C63.10-2013, Clause 5.9

An unlicensed wireless device shall be tested to demonstrate that any emissions within restricted frequency bands specified by the regulatory authority are spurious emissions only. Unless otherwise specifically authorized, the spurious emission shall meet prescribed limits and the fundamental transmit signal shall not fall within these frequency bands. Test reports shall provide measured data to demonstrate compliance with these regulatory requirements.

Restricted Bands of Operation:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.0900000 – 0.1100000	8.2910000 - 8.2940000	16.804250 - 16.804750	162.01250 - 167.17000 *	1660.0000 – 1710.0000	3.6000000 – 4.4000000	14.470000 – 14.500000
0.4950000 - 0.5050000 *	8.3620000 - 8.3660000	25.500000 - 25.670000	167.72000 - 173.20000 *	1718.8000 – 1722.2000	4.5000000 – 5.1500000	15.350000 – 16.200000
2.1735000 - 2.1905000	8.3762500 - 8.3867500	37.500000 - 38.250000	240.00000 – 285.00000	2200.0000 – 2300.0000	5.3500000 – 5.4600000	17.700000 – 21.400000
4.1250000 - 4.1280000	8.4142500 - 8.4147500	73.000000 - 74.600000	322.00000 - 335.40000	2310.0000 – 2390.0000	7.2500000 – 7.7500000	22.010000 – 23.120000
4.1772500 - 4.1777500	12.290000 - 12.293000	74.800000 - 75.200000	399.90000 – 410.00000	2483.5000 – 2500.0000 *	8.0250000 – 8.5000000	23.600000 – 24.000000
4.2072500 - 4.2077500	12.519750 - 12.520250	108.00000 - 121.94000 **	608.00000 – 614.00000	2655.0000 – 2900.0000	9.0000000 – 9.2000000	31.200000 – 31.800000
5.6770000 - 5.6830000	12.576750 - 12.577250	123.00000 - 138.00000 **	960.00000 – 1240.0000 ***	3260..0000 – 3267.0000	9.3000000 – 9.5000000	36.430000 – 36.500000
6.2150000 - 6.2180000	13.360000 - 13.410000	149.90000 - 150.05000 *	1300.0000 – 1427.0000 ***	3332.0000 – 3339.0000	10.600000 – 12.700000	Above 38.600000
6.2677500 - 6.2682500	16.420000 - 16.423000	156.52475- 156.52525	1435.0000 – 1626.5000	3345.8000 – 3358.0000	13.250000 – 13.400000	
6.3117500 - 6.3122500	16.694750 - 16.695250	156.70000 - 156.90000	1645.5000 – 1646.5000	3500.0000 – 3600.0000 ****		

* US only ** Canada 108 – 138 MHz *** Canada 960 – 1427 MHz **** Canada only

2.6.1 Test Methodology: ANSI C63.10-2013, Clause 6.6.4

From 9 kHz to 150 kHz (resolution bandwidth of 200 Hz) and from 150 kHz to 30 MHz (resolution bandwidth 9 kHz) measurements are performed with a loop antenna.

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz. The EUT is raised to 150 cm above the ground plane, and the area between the EUT and the antenna mast is covered with RF absorbent material.

The scan is performed at discreet increments of turntable azimuth and antenna height, which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

Frequencies having peak emissions within 6 dB of the limits are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 – 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

Note: The EUT was assessed for worst-case orientation. All radiated testing was performed with this orientation, as shown in the test setup photos.

2.6.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.6.3 Test Equipment

Testing was performed with this equipment:

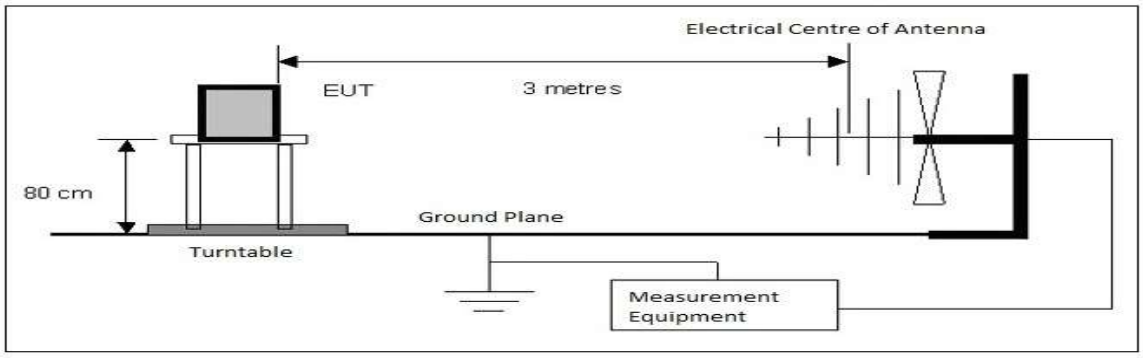
Equipment	Manufacturer	Model #	Asset #	Calibration Date (yyyy mm dd)	Calibration Due-Date (yyyy mm dd)
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A	N/A
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Biconilog Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
DRG Horn	Tensor	4105	9588	2019-04-12	2021-04-12
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43-01001800-21-5P	4354	Monitored	Monitored
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS 01102006	4419	2020-01-03	2021-01-03
Emission Cable (1000 – 5000 MHz)	A.H. System Inc.	SAC-26G-8.23	6187	2020-01-03	2021-01-03

2.6.4 Test Sample Verification, Configuration & Modifications

The EUT was made to transmit continuously by programming to simulate the continuous press on the button. The output was modulated as in normal operation. The EUT was not modified.

EUT is modified to provide the external power via DC power supply for testing purpose only.

EUT configuration for Radiated Spurious Emissions testing:



Above 1 GHz EUT Height is 150 cm.

2.6.5 Radiated Emissions Data:

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value of the limit at the frequency investigated, and the Delta between the result and the limit.

Meter Reading in dBμV + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in dbμV/m.

Delta = Field Strength - Limit

Notes:

- When a preamp is used, the resulting gain is compensated, producing a negative value for the Cable Loss.
- Measurements reported are the result of adjusting the turntable azimuth and antenna height to obtain the maximum EUT emission. This may produce a different reading than the plot trace. The plot is a Peak Hold function obtained at discreet increments of height and azimuth, while the reported measurement is obtained with the appropriate Quasi Peak or Average detector after the height and azimuth have been adjusted for maximum emission.
- Preliminary scans were performed in Transmit mode.
- The EUT was assessed up to 5 GHz.

Negative values for Delta indicate compliance.

Transmitter Radiated Emission Test Result Data

Field Strength of Fundamental test result

Freq. (MHz)	Raw reading (dBµV)	Antenna Factor (dB/m)	Pre-Amp Gain (dB)	Duty Cycle Correction Factor (dB)	Corrected Peak Field Strength Reading (dBµV/m)	Peak Field Strength Limit (dBµV/m)	Peak Field Strength Margin [dB]	Corrected Average Field Strength Reading (dBµV/m)	Average Field Strength Limit	Average Field Strength Margin [dB]	Polarization
431.06	85.54	20.5	-21	-19.74	85.04	92.77	-7.73	65.3	72.77	-7.47	H
431.06	79.357	20.5	-21	-19.74	78.86	92.77	-13.91	59.12	72.77	-13.65	V
433.06	84.927	20.4	-21	-19.74	84.33	92.84	-8.51	64.59	72.84	-8.25	H
433.06	78.759	20.5	-21	-19.74	78.26	92.84	-14.58	58.52	72.84	-14.32	V

Field Strength of Spurious Emission test result

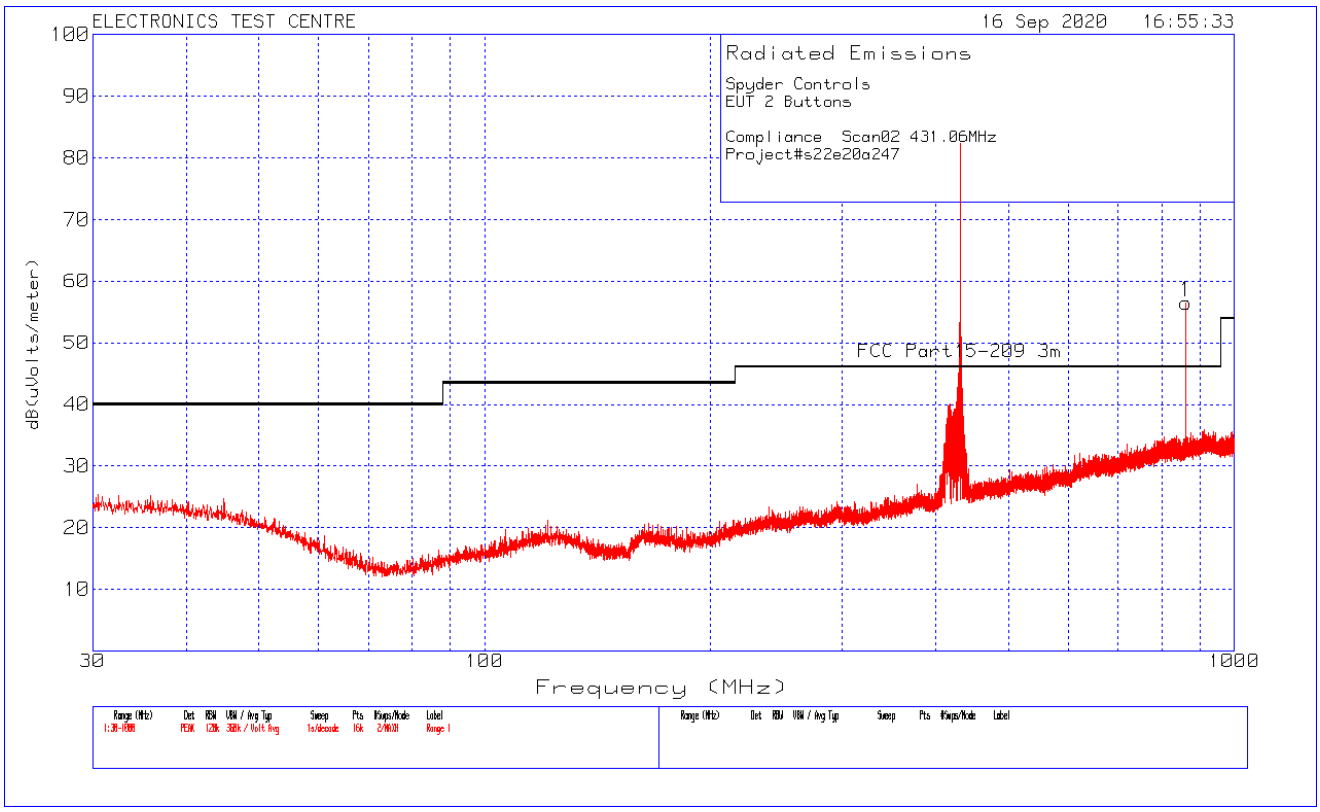
Freq. (MHz)	Raw reading (dBµV)	Antenna Factor (dB/m)	Pre-Amp Gain (dB)	Duty Cycle Correction Factor (dB)	Corrected Peak Field Strength Reading (dBµV/m)	Peak Field Strength Limit (dBµV/m)	Peak Field Strength Margin [dB]	Corrected Average Field Strength Reading (dBµV/m)	Average Field Strength Limit	Average Field Strength Margin [dB]	Polarization
Fundamental TX Frequency: 431.06 MHz											
861.94	58.00	25.4	-18.6	-19.74	64.8	74	-9.2	45.06	54	-8.94	H
861.94	59.44	25.4	-18.6	-19.74	66.25	74	-7.75	46.51	54	-7.49	V
1293.2	72.88	24.8	-29.8	-19.74	67.88	74	-6.12	48.14	54	-5.86	H
1724.3	61.13	26.8	-27.2	-19.74	60.73	74	-13.27	40.99	54	-13.01	H
1293.2	66.78	24.8	-29.8	-19.74	61.78	74	-12.22	42.04	54	-11.96	V
*3878.6	44.97	32.7	-24.2	-19.74	53.71	74	-20.59	33.97	54	-20.03	H
*3878.6	44.97	32.7	-24.2	-19.74	53.71	74	-20.29	33.97	54	-20.03	H
4740.5	43.91	32.9	-21.8	-19.74	55.01	74	-18.99	35.27	54	-18.73	H
Fundamental TX Frequency: 433.06 MHz											
1298.9	73.850	24.8	-29.8	-19.74	68.85	74	-5.15	49.11	54	-4.89	H
1731.9	61.06	26.9	-27.1	-19.74	60.86	74	-13.14	41.12	54	-12.88	H
1298.9	67.49	24.8	-29.8	-19.74	62.49	74	-11.51	42.75	54	-11.25	V
*3897.7	43.43	32.7	-24.1	-19.74	52.03	74	-21.97	32.29	54	-21.71	H
*3897.7	43.43	32.7	-24.1	-19.74	52.03	74	-21.97	32.29	54	-21.71	H
4762.6	44.86	33	-21.8	-19.74	56.06	74	-17.06	36.32	54	-17.68	H

* **Restricted Band**

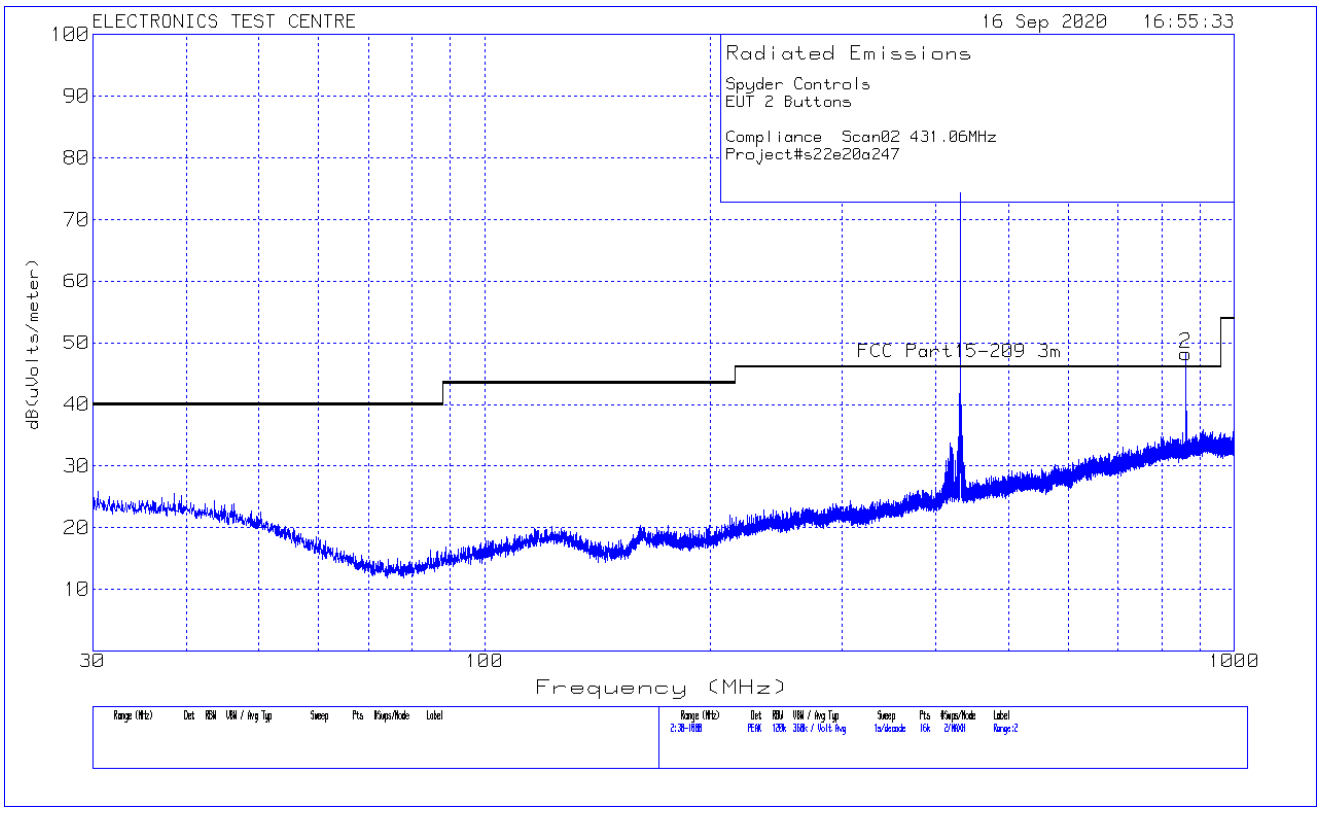
Note: Spectrum analyzer setting for measurement:

- 30 – 1000 MHz: Peak Detector, RBW: 120KHz, VBW: 360KHz
- Above 1 GHz: Peak Detector, RBW: 1MHz, VBW: 3MHz
- Duty Cycle Correction Factor as calculated from §15.35(c)
- Average field Strength (dBuv/m) = Peak field strength(dBuv/m) + Duty Cycle correction Factor (dB)

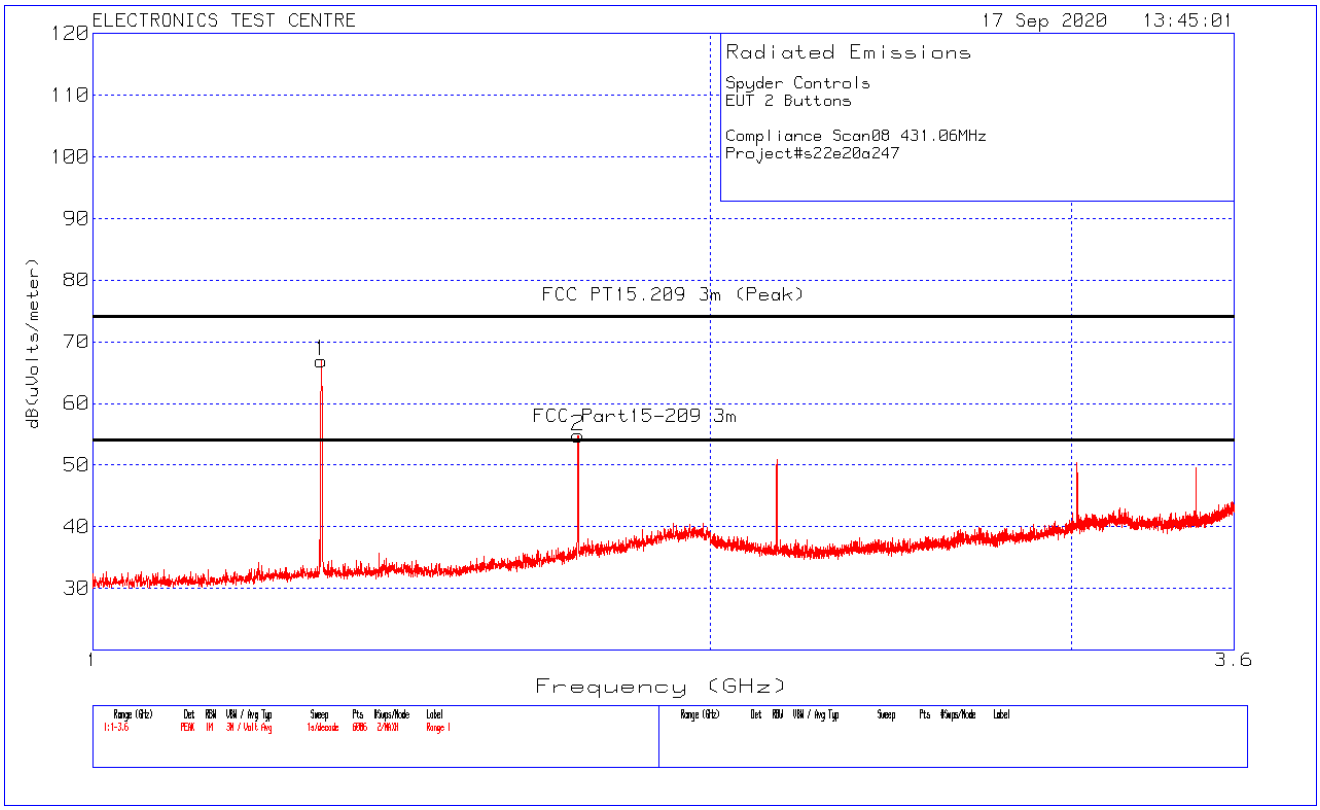
Plot of Radiated Emissions: Horizontal polarization Tx@431.06 MHz



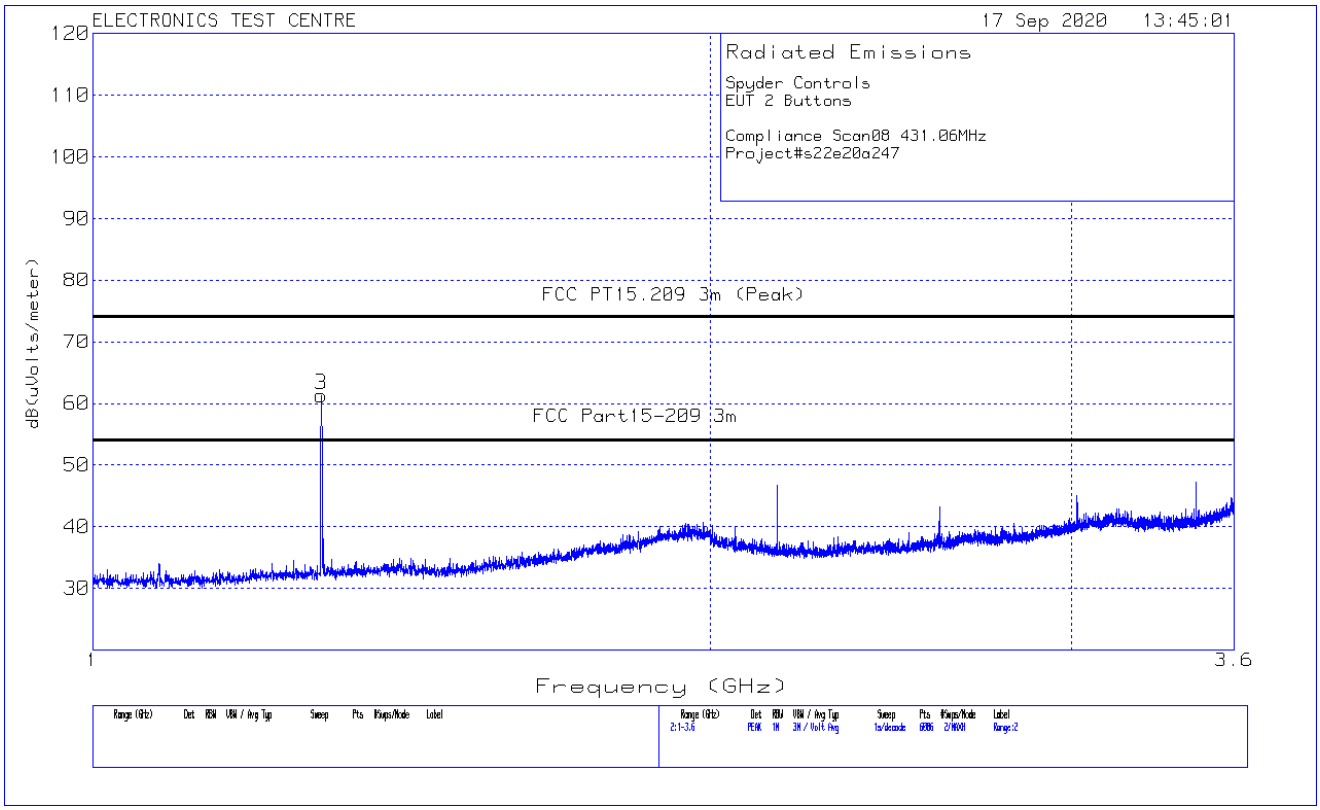
Plot of Radiated Emissions: Vertical polarization TX@431.06 MHz



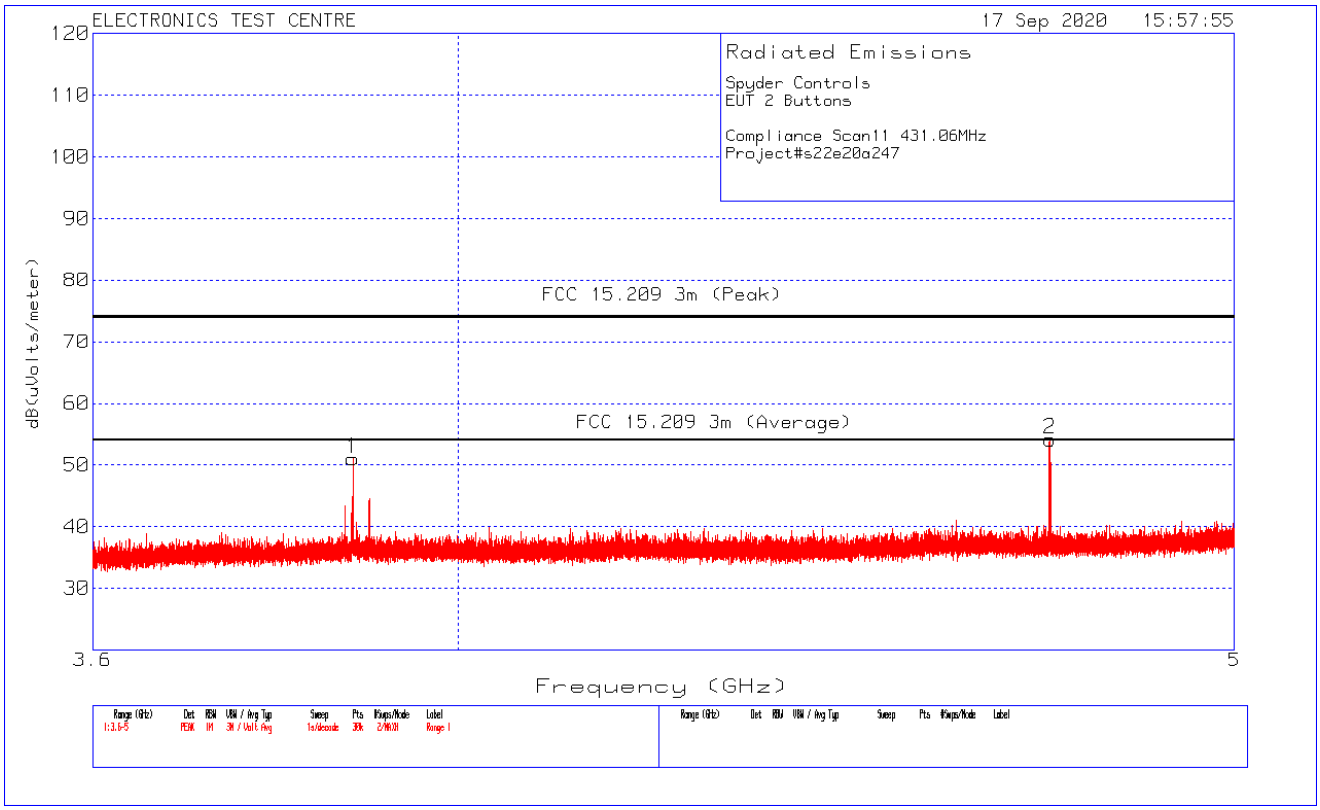
Plot of Radiated Emissions: Horizontal polarization Tx@431.06 MHz



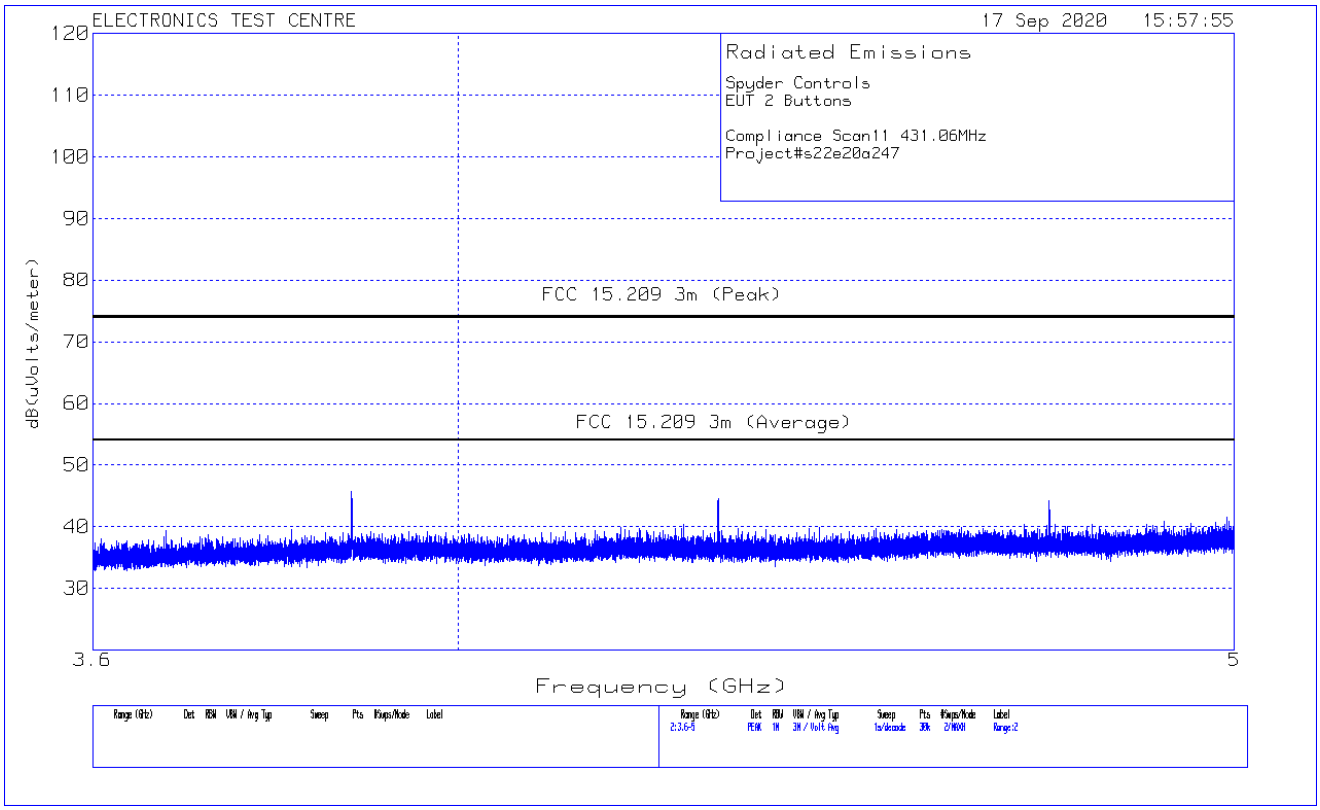
Plot of Radiated Emissions: Vertical polarization TX@431.06 MHz



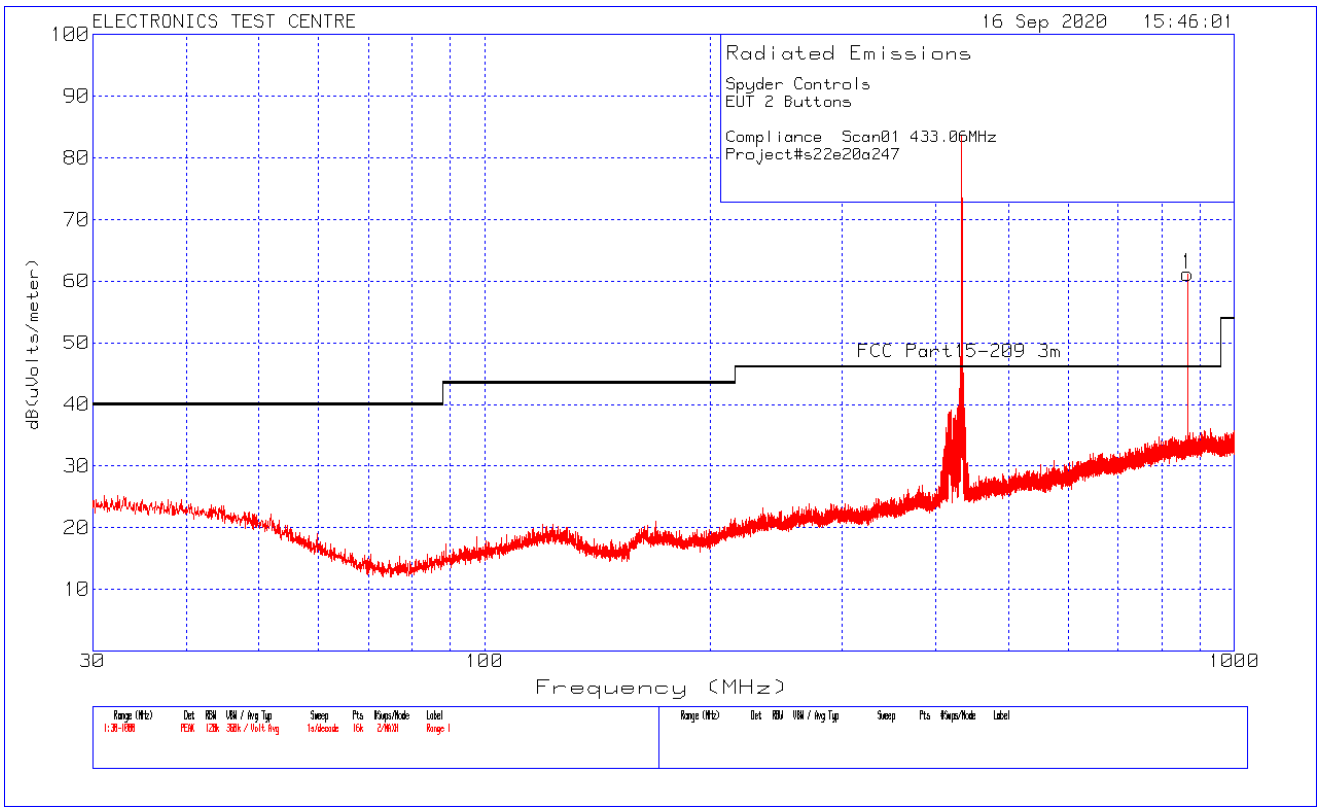
Plot of Radiated Emissions: Horizontal polarization TX@431.06 MHz



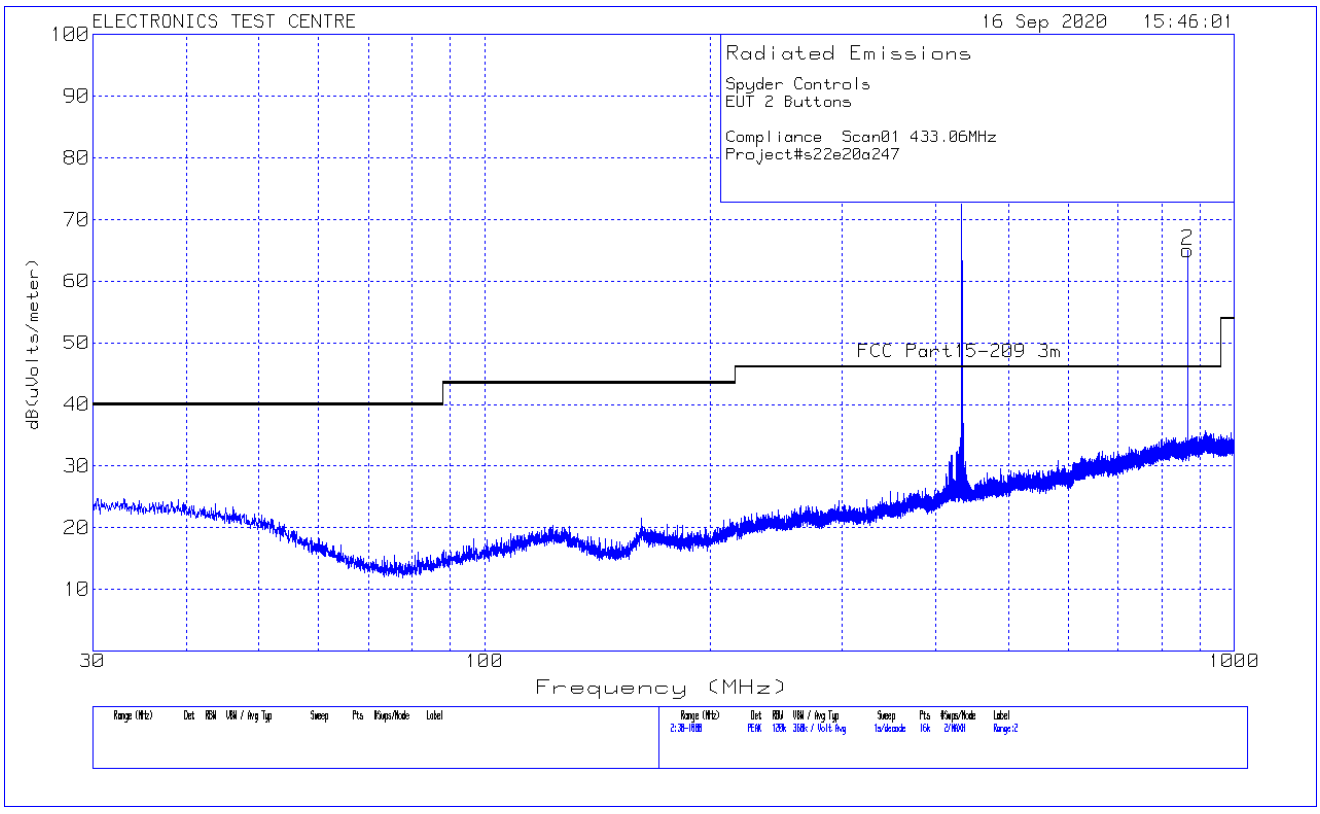
Plot of Radiated Emissions: Vertical polarization TX@431.06 MHz



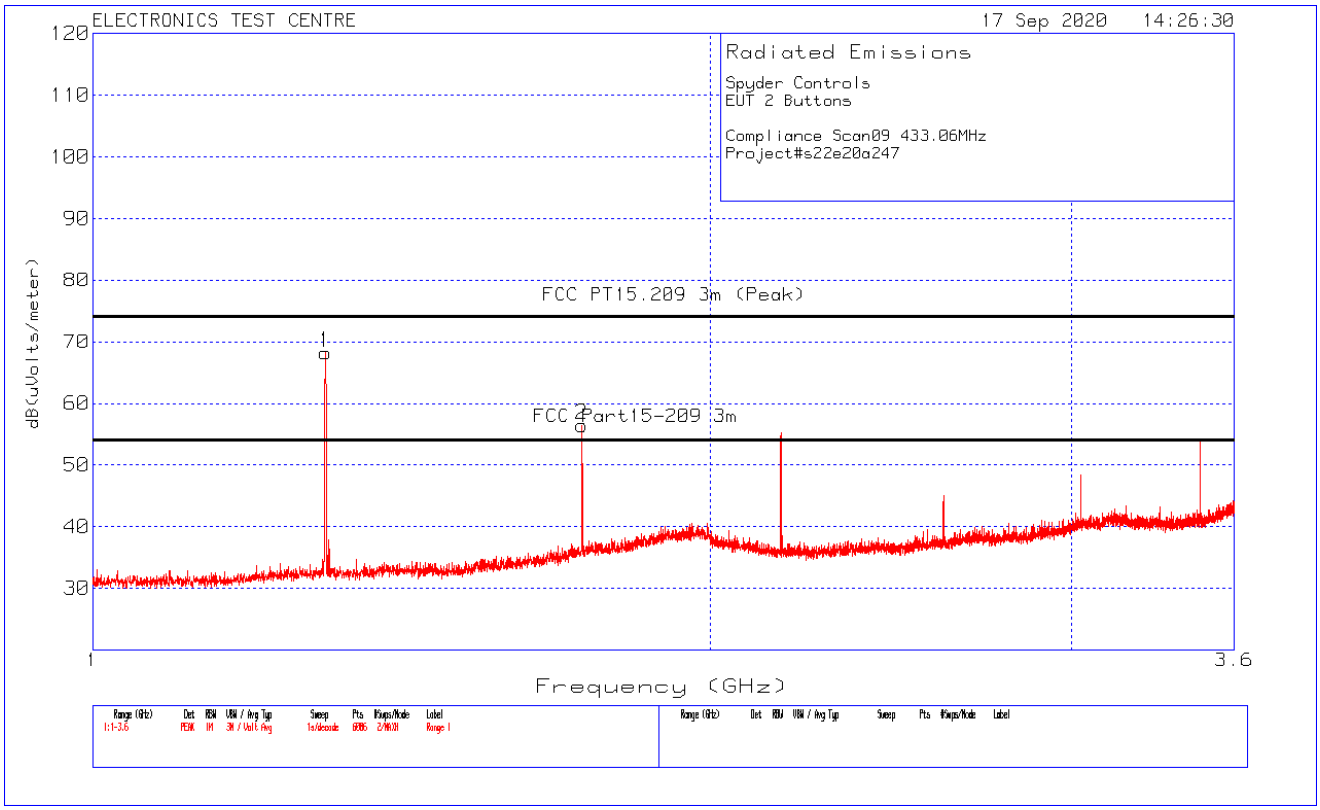
Plot of Radiated Emissions: Horizontal polarization Tx@433.06 MHz



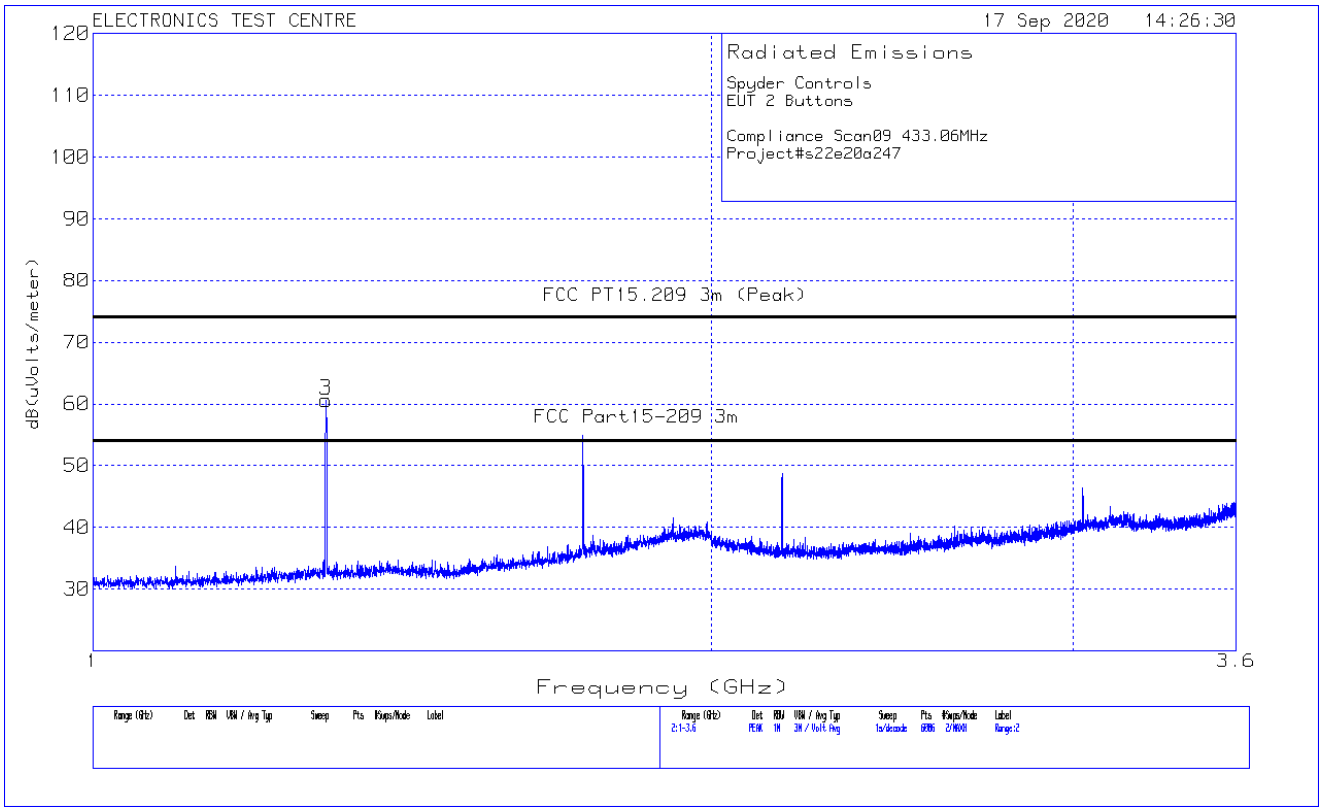
Plot of Radiated Emissions: Vertical polarization TX@433.06 MHz



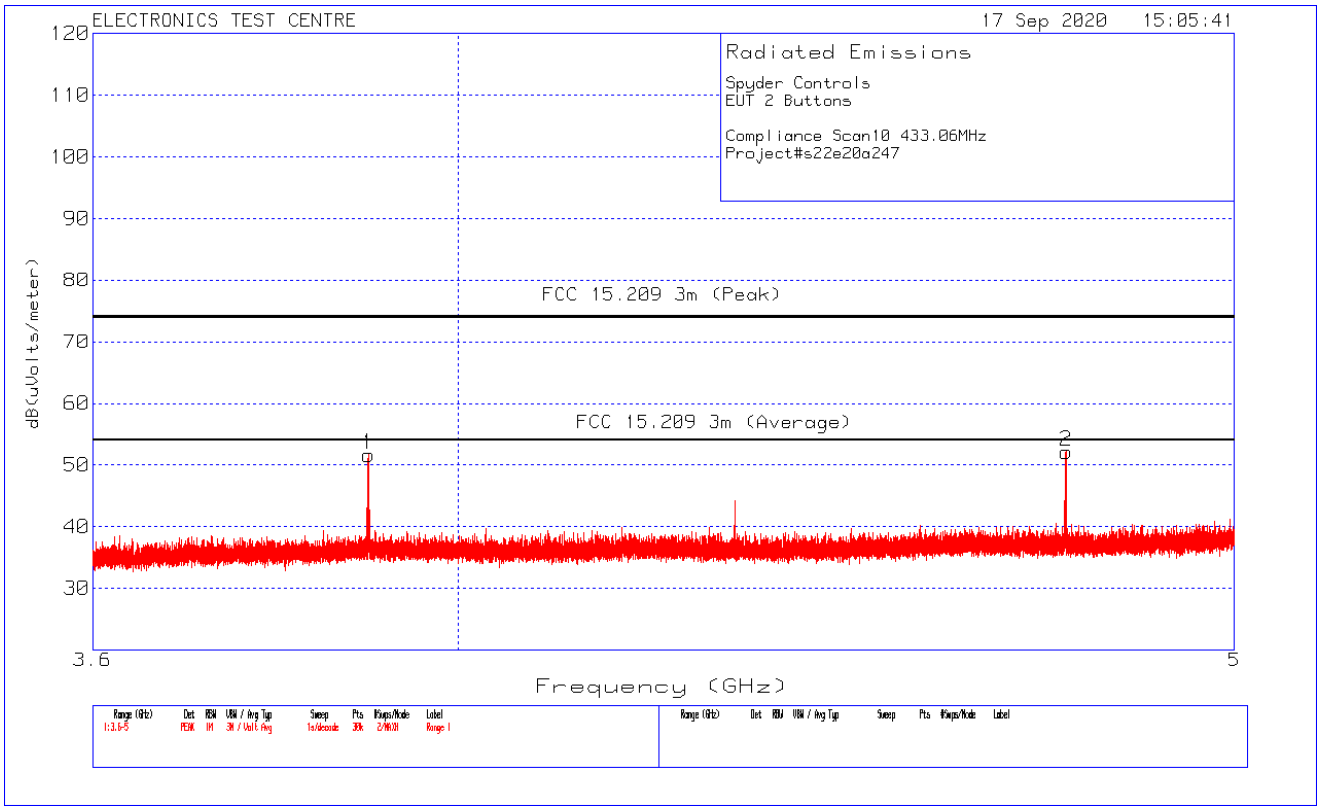
Plot of Radiated Emissions: Horizontal polarization Tx@433.06 MHz



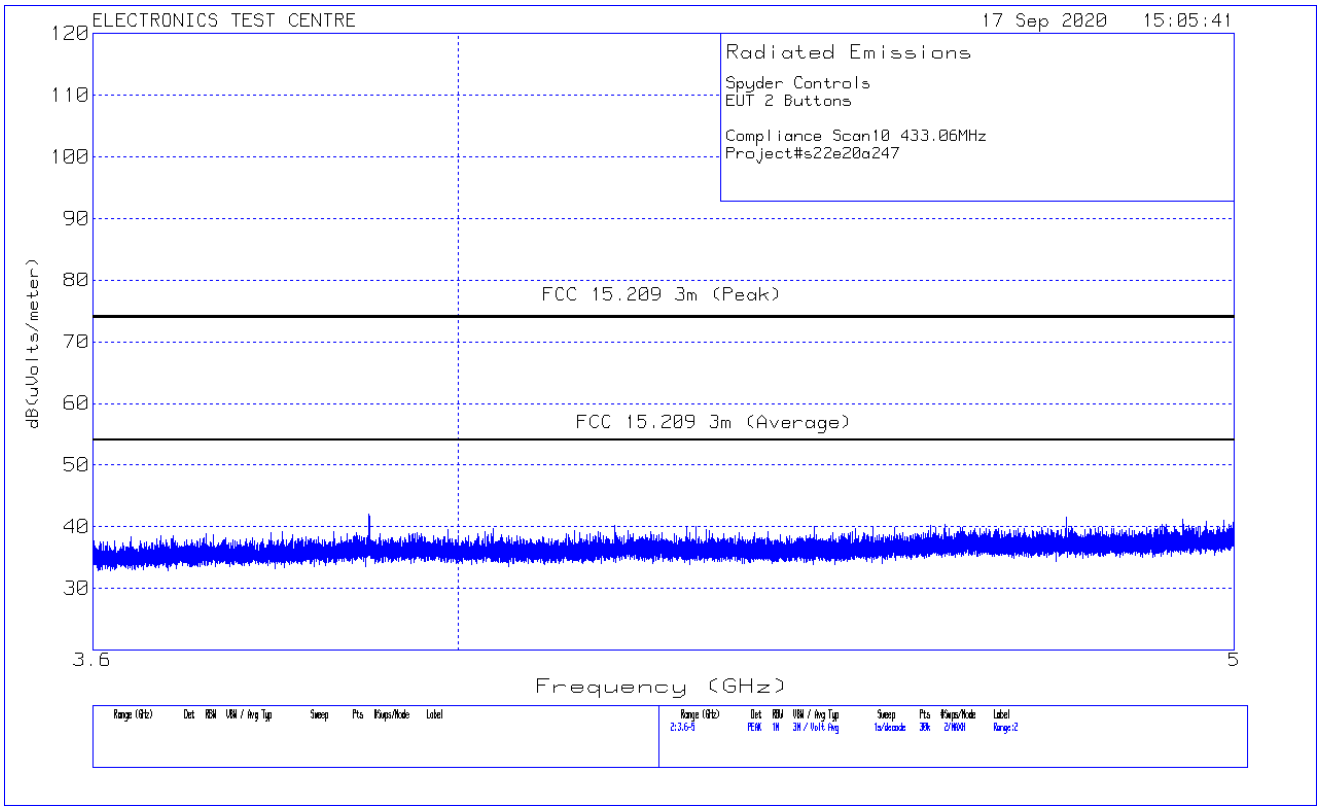
Plot of Radiated Emissions: Vertical polarization TX@433.06 MHz



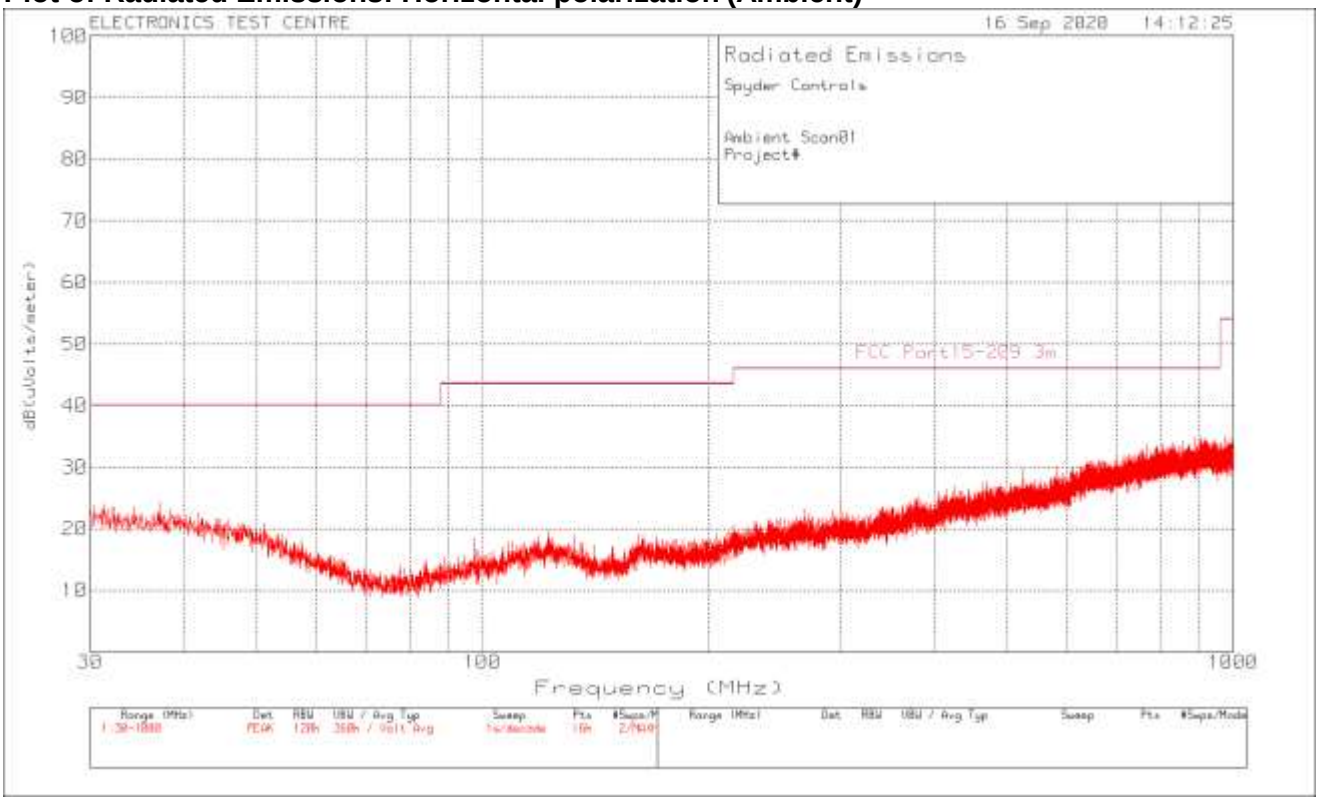
Plot of Radiated Emissions: Horizontal polarization TX@433.06 MHz



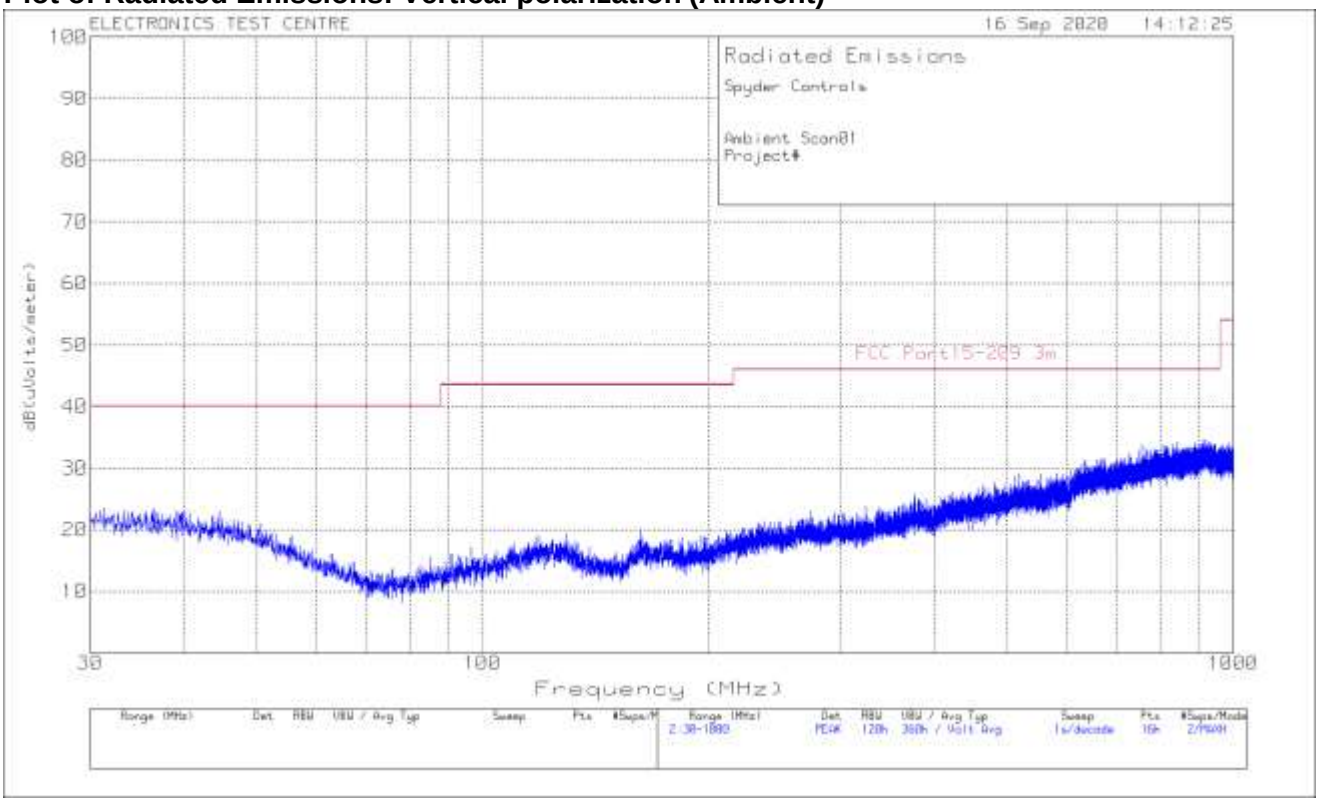
Plot of Radiated Emissions: Vertical polarization TX@433.06 MHz



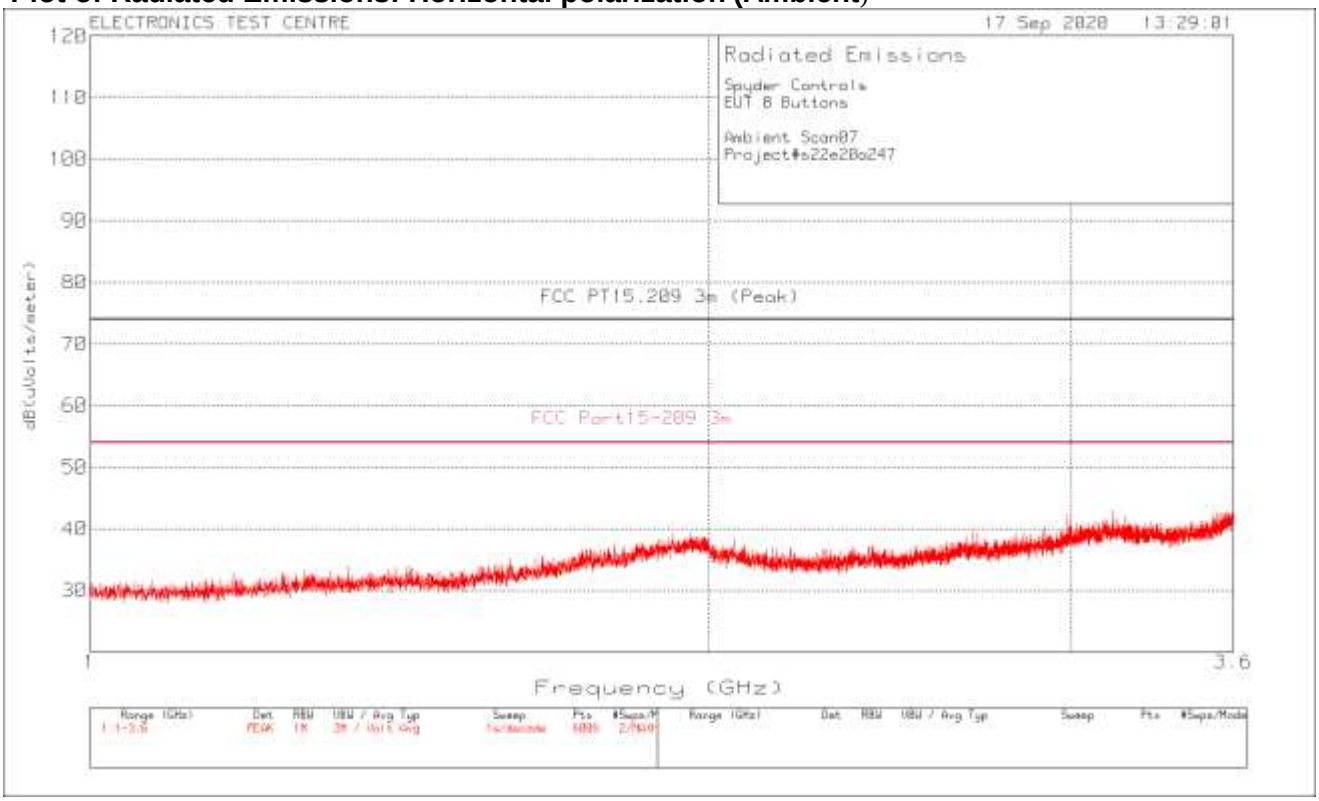
Plot of Radiated Emissions: Horizontal polarization (Ambient)



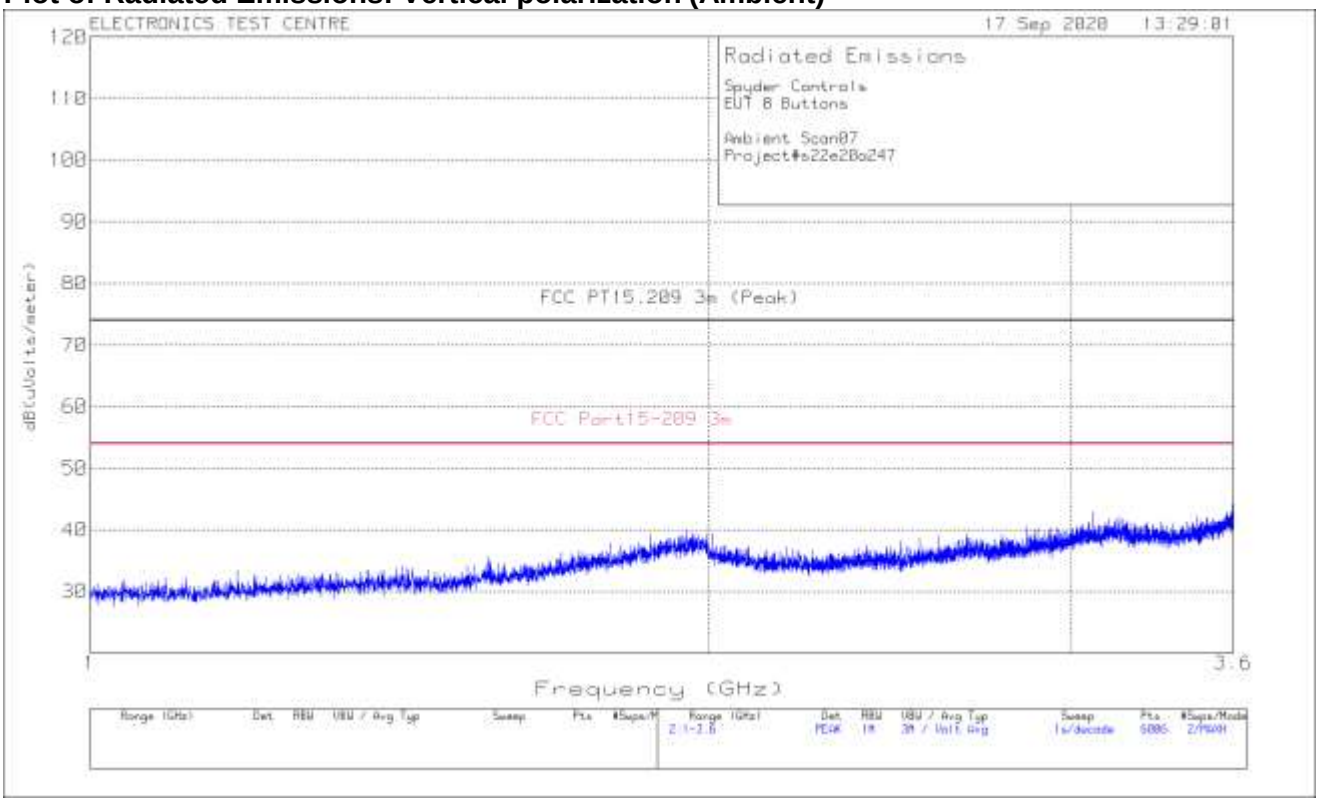
Plot of Radiated Emissions: Vertical polarization (Ambient)



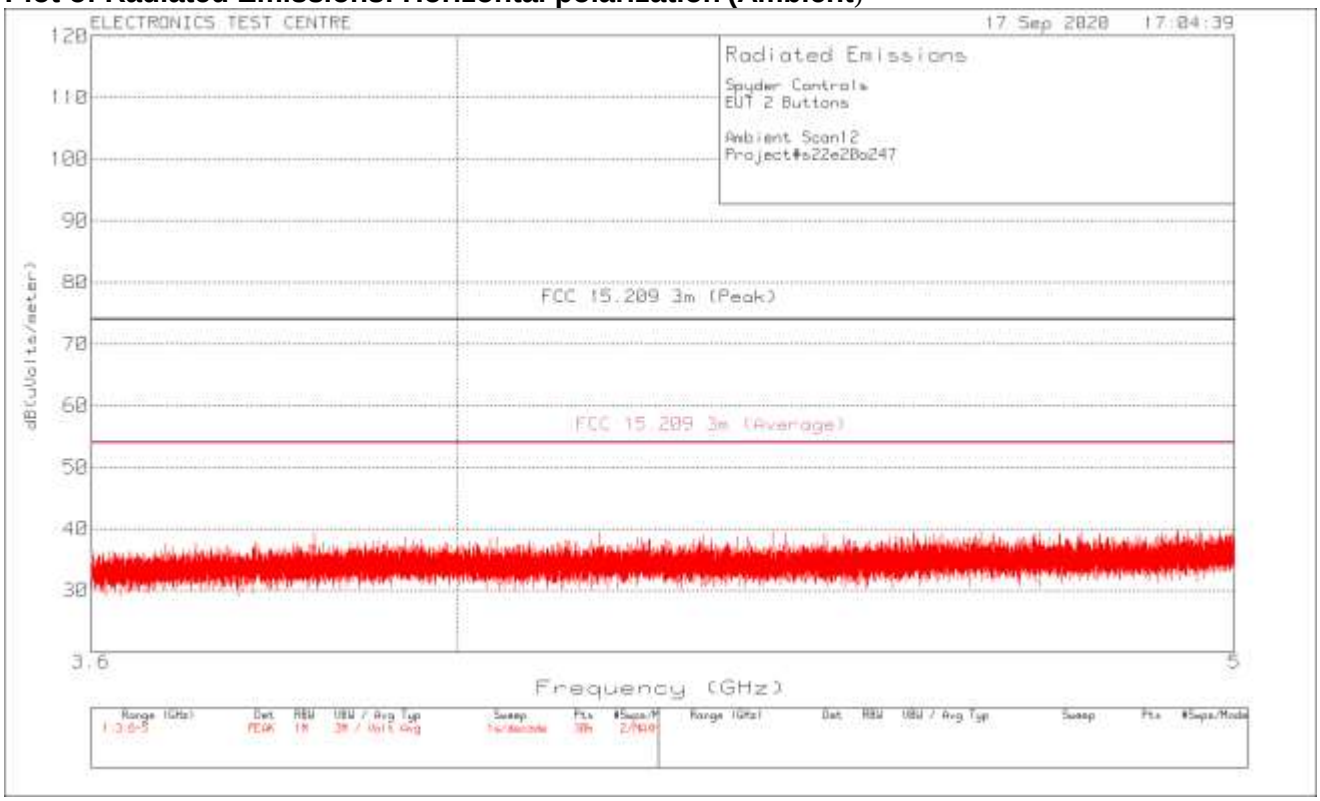
Plot of Radiated Emissions: Horizontal polarization (Ambient)



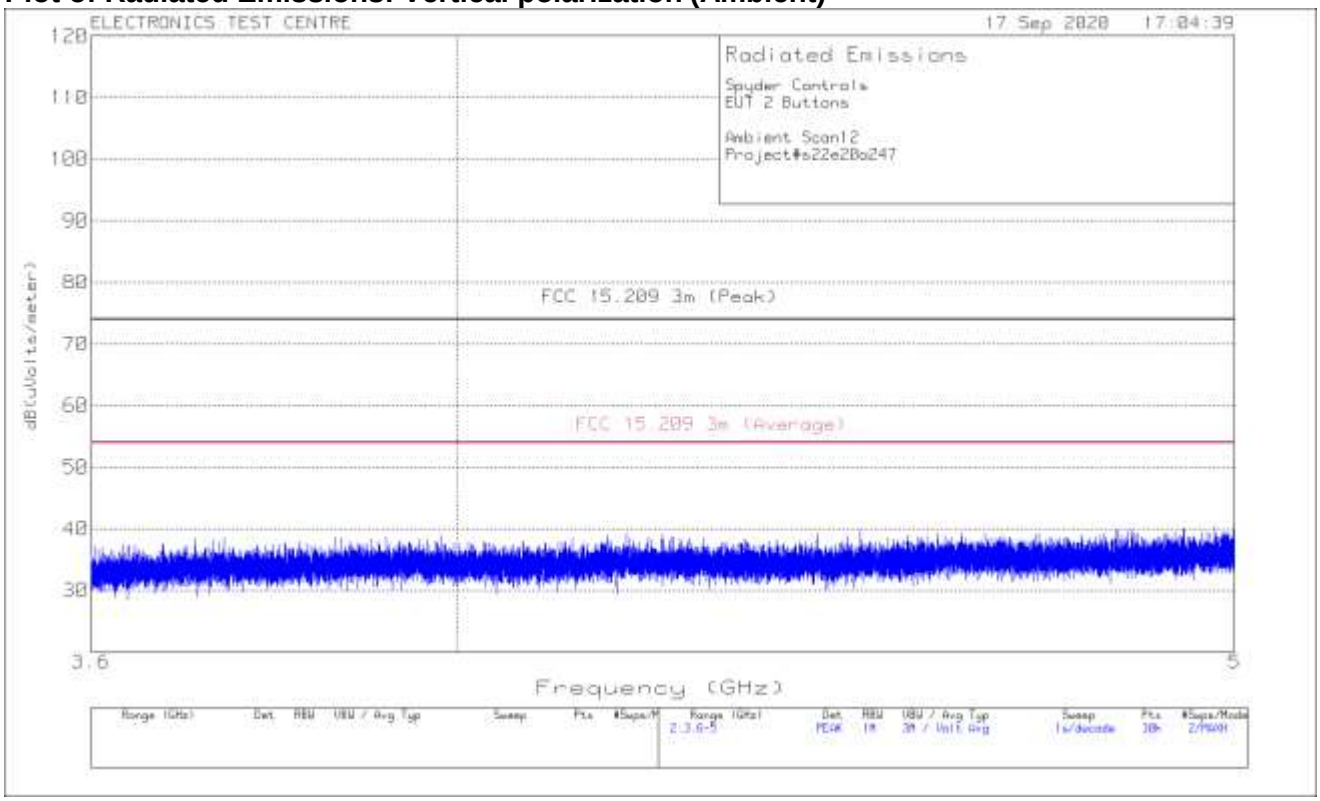
Plot of Radiated Emissions: Vertical polarization (Ambient)



Plot of Radiated Emissions: Horizontal polarization (Ambient)



Plot of Radiated Emissions: Vertical polarization (Ambient)



2.7 RF Exposure

Test Lab: Electronics Test Centre, Airdrie	**EUT: Spyder Controls** **Standard: FCC PART 1.1307(b)(1), FCC §2.1091, §1.1310 and FCC KDB 447498:2015.**
EUT status: Compliant	

Compliant: See RF exposure evaluation submitted separately.

3.0 TEST FACILITY

3.1 Location

The Spyder Controls was tested for emissions at the Electronics Test Centre laboratory located in Airdrie, Alberta, Canada. The Radio Frequency Anechoic Chamber (RFAC), identified as Chamber 1, has a usable working space measuring 10.6 m long x 7.3 m wide x 6.5 m high.

Measurements taken at this site are accepted by Industry Canada as evidence of conformity per registration file # 2046A. This site is also listed with the FCC under Designation Number CA2046.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment located in the Control Room. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in the Control Room, consisting of two shielded vestibules joined together at the side of the main room. Cables are routed through bulkhead panels between the rooms and the test chamber as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

Either floor mounted or table-top equipment can be tested at this facility.

3.2 Grounding Plan

The Spyder Controls was placed at the centre of the test chamber turntable on top of a polystyrene foam table. The EUT was not grounded, in accordance with Spyder Controls Corporation specifications.

3.3 Power Supply

All EUT power was supplied by 3.0 VDC power Supply.

3.4 Emissions Profile

Ambient emission profiles were generated throughout the tests and are included in the test data.

End of Document