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Test Report Prepared By:

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ETC Report #: s22e20a247-FCC Release 2 Date: Date: 2020-12-15
Test Dates: September 16, 17,18 and 19, 2020

EMC testing of the Spyder Controls Corporation RF Fob is performed in accordance with FCC Part 15.231, ANSI C63.10-2013.

FCC ID: OV9BSSPWZIPA

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Prepared for: Spyder Controls Corporation
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REVISION RECORD

ISSUE	DATE	AUTHOR	REVISIONS
DRAFT 1	2020-09-21	I. Akram	Initial draft submitted for review.
DRAFT 2	2020-11-12	I. Akram	Updated Serial# and FCC ID
Release 1	2020-12-09	M. Rousseau	Sign off
Release 2	2020-12-15	M. Rousseau	Correct customer address

TABLE OF CONTENTS

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 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:	RF Fob
Frequency Band	260-470 MHz
Type of Modulation	FSK
Frequency	431.06 MHz, 433.06 MHz
Associated Antenna	Non-Detachable, Loop , -6 dBi
Model #	RF 8 Button Key Fob
Serial #	FRKF-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 15.231and 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)	±4.92 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)	RF Fob	none	see § 2.1	**N/A**
2.2	Periodic Operation and Periodic transmissions at regular predetermined intervals	FCC Part 15.231(a) (1) FCC Part 15.231(a) (3)	RF Fob	none	see § 2.2	**Compliant**
2.3	Duty Cycle	ANSI C63.10 FCC part15.35(c)	RF Fob	none	see § 2.3	**Compliant**
2.4	Occupied Bandwidth	ANSI C63.10 FCC part 15.231(c)	RF Fob	none	see § 2.4	**Compliant**
2.5	EUT Position	ANSI C63.10	RF Fob	none	see § 2.5	**Compliant**
2.6	Tx Radiated Emissions	FCC Part 15.231(b), FCC15.209, FCC 15.205	RF Fob	none	see § 2.6	**Compliant**
2.7	RF Exposure	FCC Part 1.1307(b)(1)	RF Fob	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: RF Fob**
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 Periodic Operation Characteristics

Test Lab: Electronics Test Centre, Airdrie	**EUT: RF Fob**
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(a) (1), (3)

The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation. **– (N/A)**

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition **– (N/A)**

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data. **– (N/A)**

2.2.1 Test Methodology:

This measurement is performed with modulation.

If the EUT antenna is integral to the device, the radiated output is measured with an antenna placed to capture the emissions.

The spectrum analyzer is set for a 0 Hz frequency span (time domain) centered on the carrier. The RBW is set to 100 kHz and VBW is set to 300 kHz. The Peak detector is used, with the trace set to Video or level Trigger and Single Sweep. The Marker Delta function measures the transmit duration of resulting trace.

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:

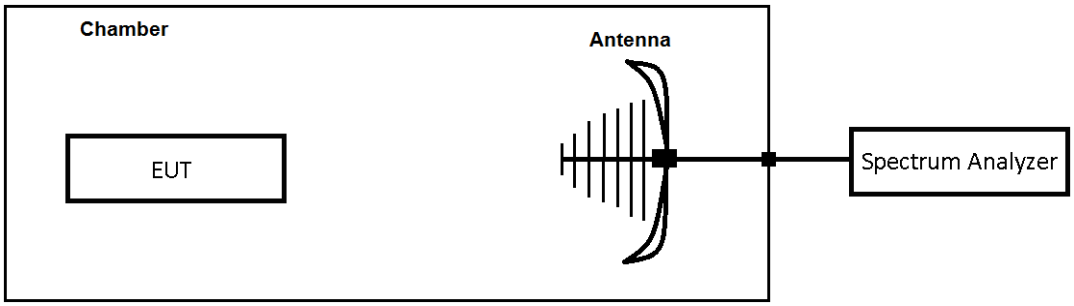
Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS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

2.2.4 Test Sample Verification, Configuration & Modifications

This EUT does not support wireless continuous transmission, voice, and video and radio control of toys. The device does not activate automatically. 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 also transmits periodically, once on each frequency every 4 to 5 minutes, each transmission is 5 milliseconds long less than 2 sec.

The EUT met the requirements without modification.

EUT configuration for Periodic Operation testing:



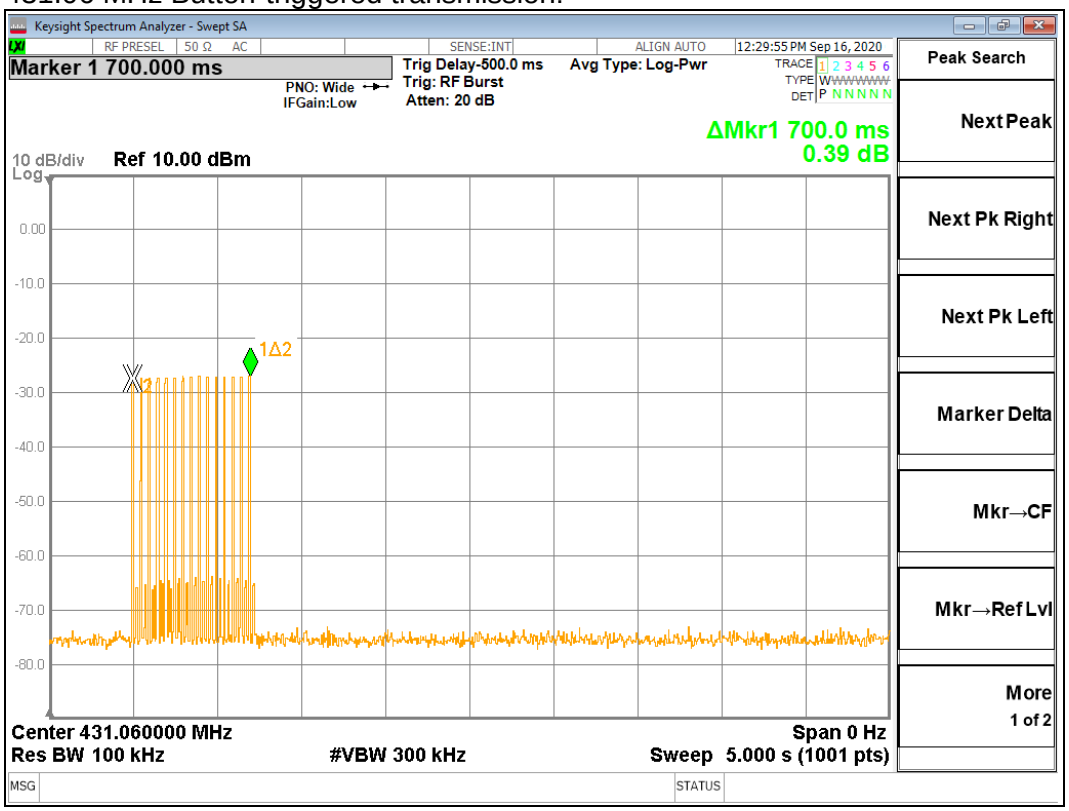
2.2.5 Summary of test Results / Plots:

Note: The button was pressed and released manually, so the associated trace captures include the time the button was being pressed.

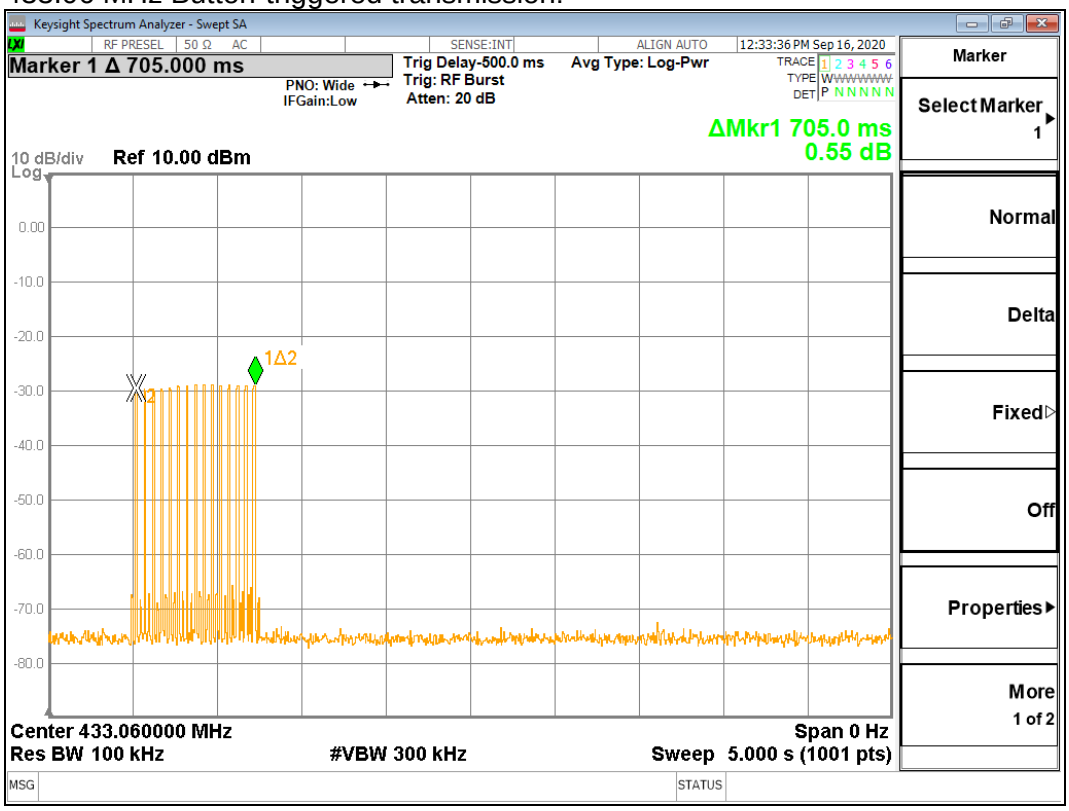
Carrier Frequency [MHz]	Measured Transmission Time (sec)	Time Limit (sec)	Result
FCC Part 15.231(a) (1) - Manually operated transmitter			
431.06	.7	5	Compliant
433.06	.705	5	Compliant
FCC Part 15.231(a) (3) - Periodic transmissions at regular predetermined intervals			
Carrier Frequency [MHz]	Measured ON Time every (4 minute)	Time limit in 1 Hour ≤ 2 sec	Result
431.06	5.565ms	5.565ms x 15 = 83.5msec	Compliant
433.06	5.550ms	5.550ms x 15 = 83.3msec	Compliant

Screen Captures from the spectrum analyzer:

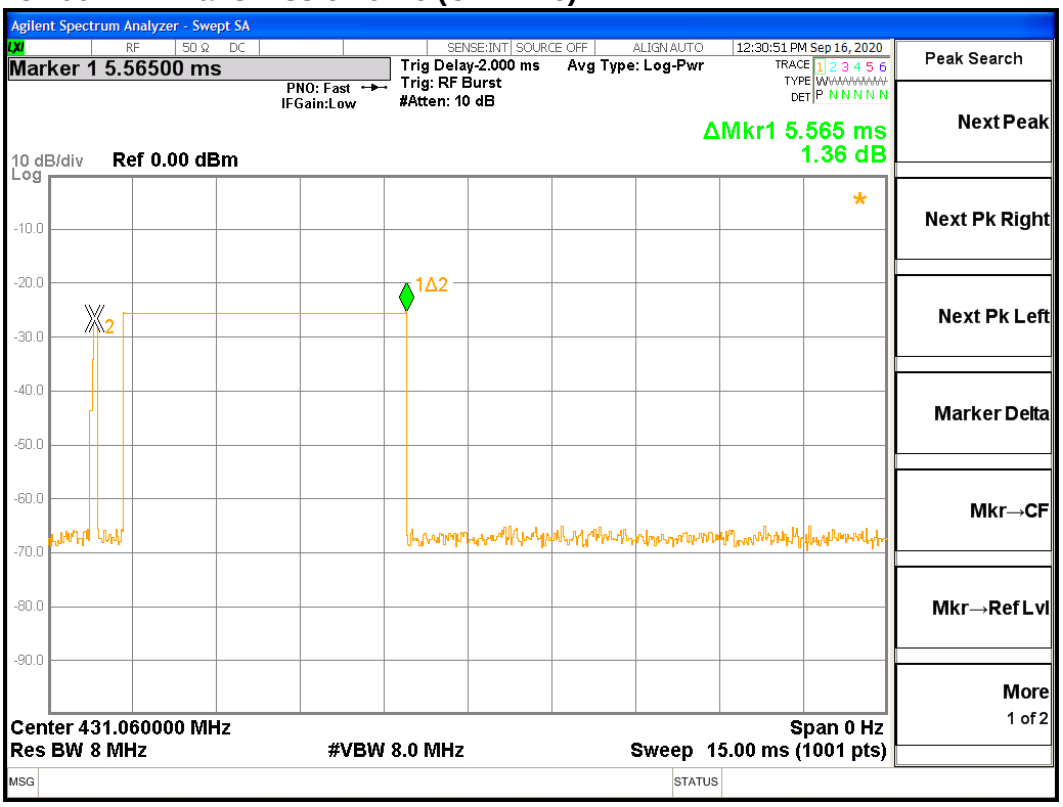
431.06 MHz Button-triggered transmission:



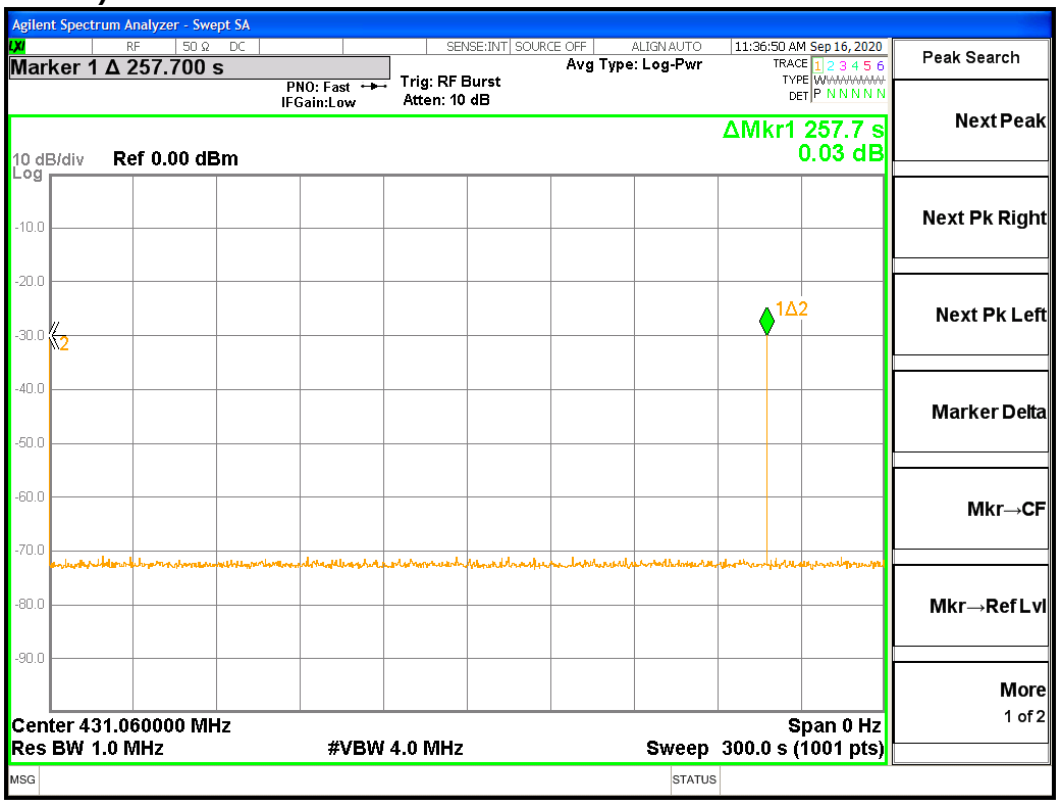
433.06 MHz Button-triggered transmission:



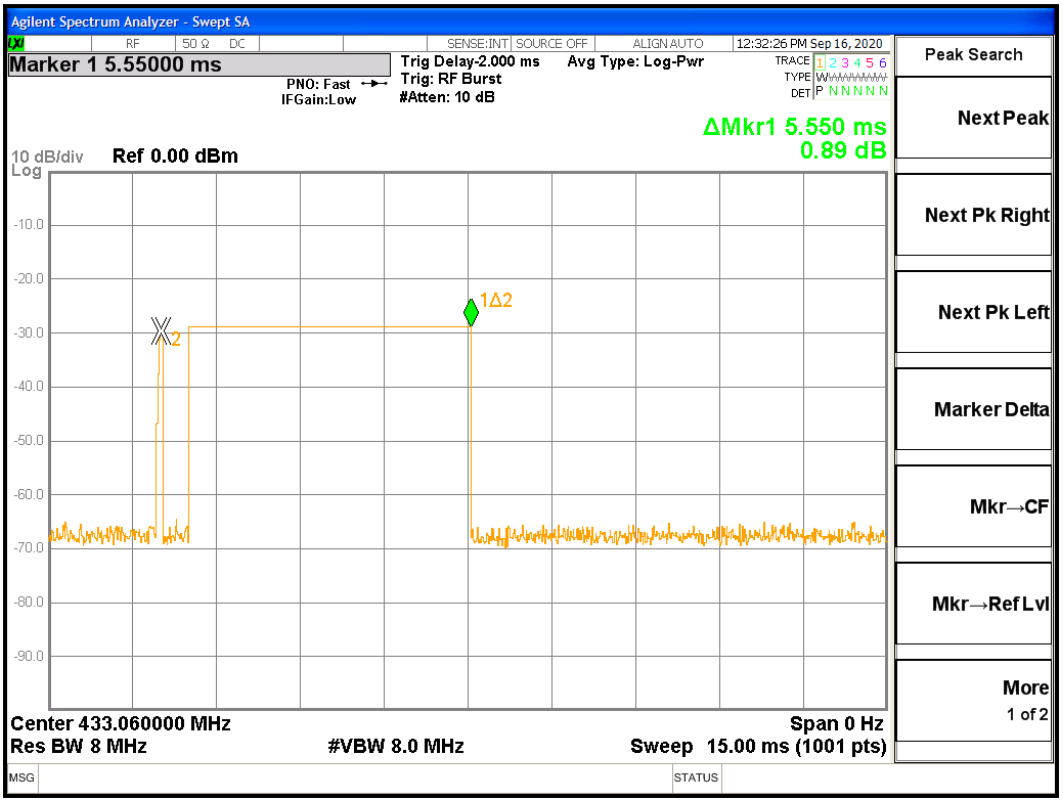
431.06 MHz Transmission time (ON Time)



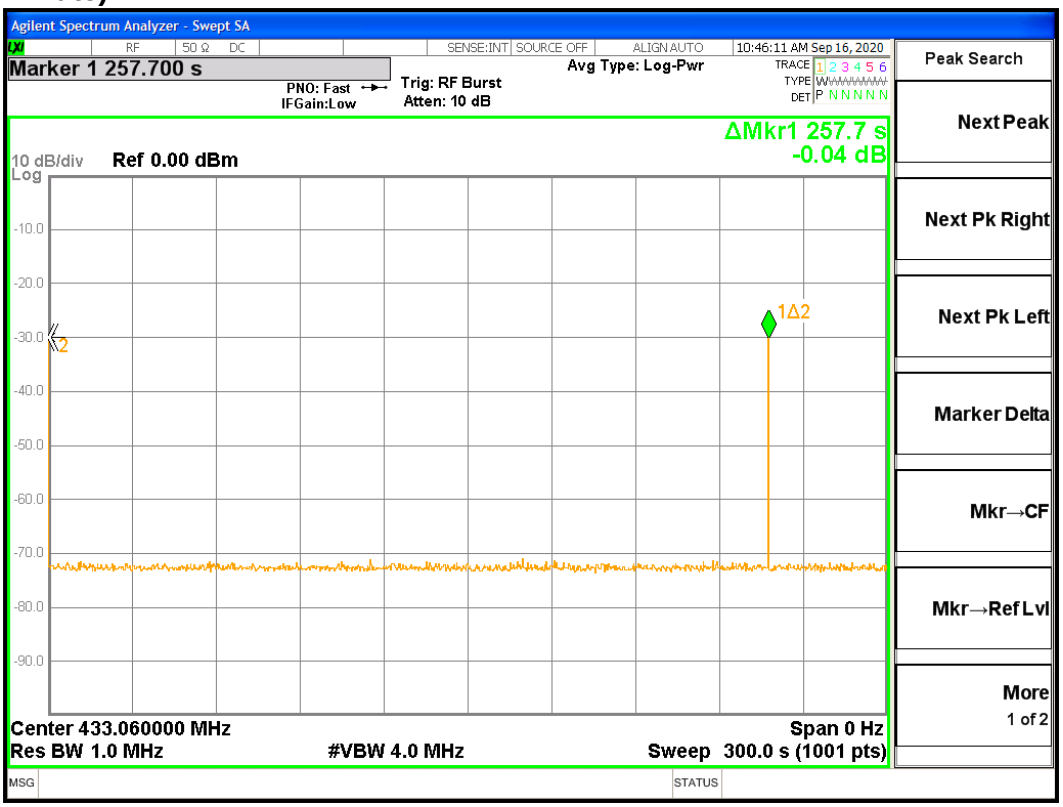
431.06 MHz Periodic transmissions at regular predetermined intervals (Every 4-5 minute)



433.06 MHz Transmission time (ON Time)



433.06 MHz Periodic transmissions at regular predetermined intervals (Every 4-5 minute)



2.3 Channel Occupied Bandwidth

Test Lab: Electronics Test Centre, Airdrie	**EUT: RF Fob**
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.

2.3.1 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.

2.3.2 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:

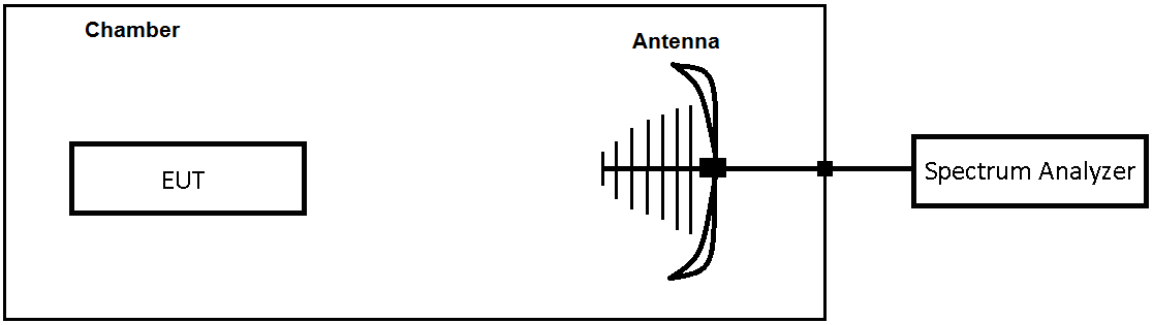
Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS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

2.3.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously by test specific 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:

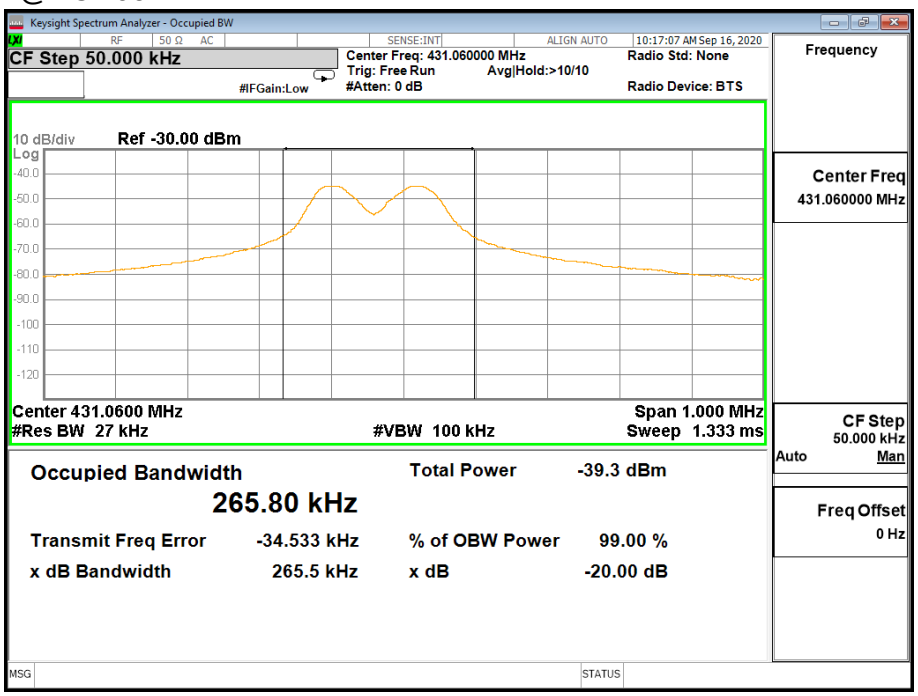


2.3.5 Summary of test Results / Plots:

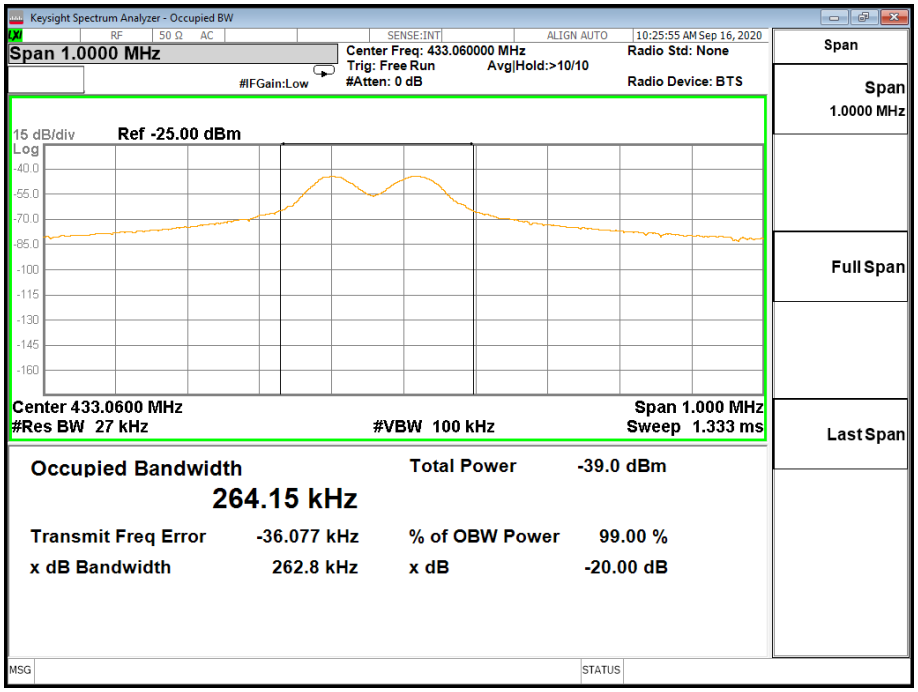
Carrier Frequency [MHz]	Maximum Limit 20 dB OBW [MHz]	Measured 20 dB OBW [MHz]	Margin [MHz]
431.06	1.08	0.2655	0.8145
433.06	1.08	0.2628	0.8172

Screen Captures from the spectrum analyzer:

20dB BW @ 431.06 MHz:



20dB BW @ 433.06 MHz:



2.4 Duty Cycle Correction Factor

Test Lab: Electronics Test Centre, Airdrie	**EUT: RF Fob**
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

2.4.1 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.

2.4.2 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:

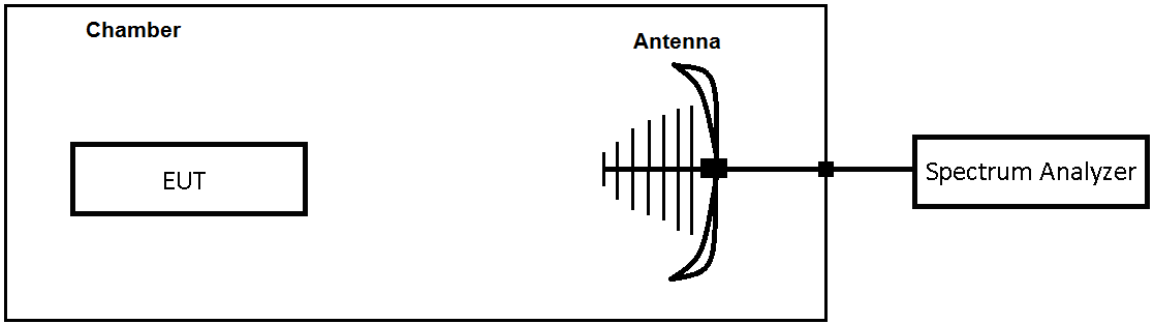
Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2020-05-27	2021-05-27
Antenna	ARA	LPB-2520/A	4318	2018-09-19	2020-09-19
Temp/RH logger	Extech	42270	5892	2020-04-07	2021-04-07
Emission Cable (30 – 1000 MHz)	IW	KPS-1501A-3600-KPS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

2.4.4 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:



2.4.5 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: 117.6µs + 5.062ms = 5.18ms

Total ON time = 5.18 x 2 = 10.36

Duty Cycle = 10.36 / 100 = 0.104

DCCF = 20 * $\log_{10}$(0.104) = **-19.66 dB**

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

Pulse Width: 124.8µs + 5.041ms = 5.17ms

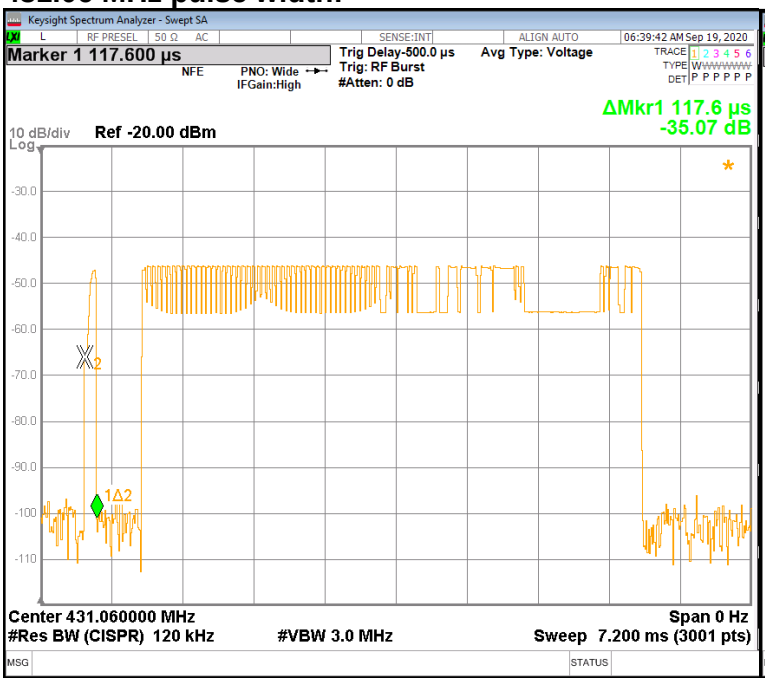
Total ON time = 5.17 x 2 = 10.34

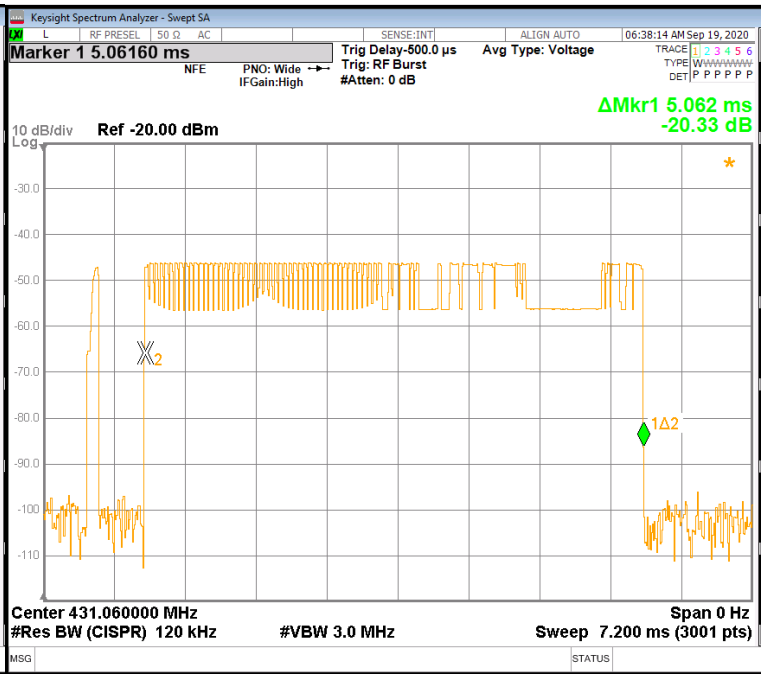
Duty Cycle = 10.34 / 100 = 0.1034

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

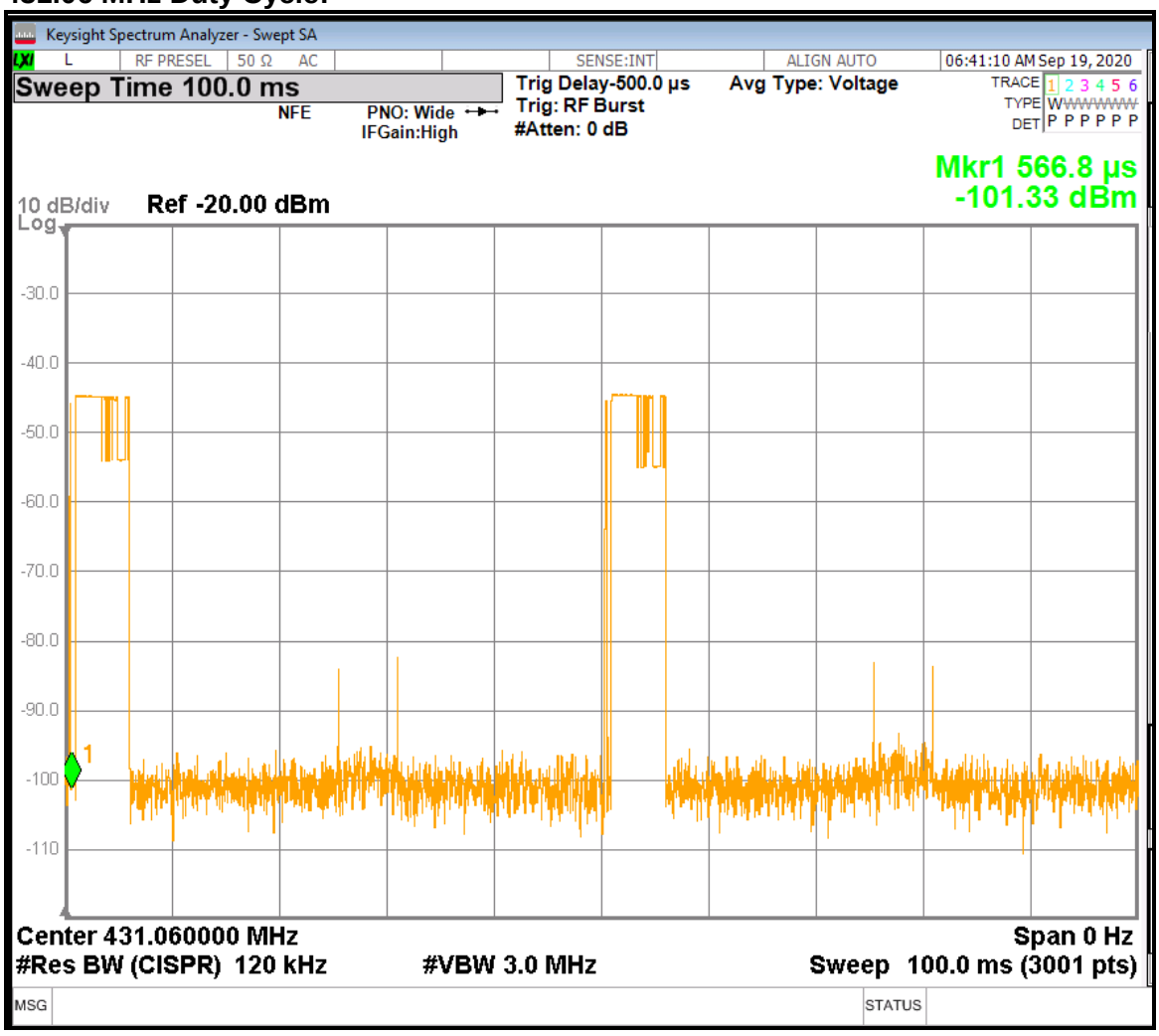
Note: The 100 ms traces show some bleed-through from the adjacent carrier frequency, but at more than 50 dB below the frequency of interest, this was not considered as part of the DCCF calculation.

431.06 MHz pulse width:

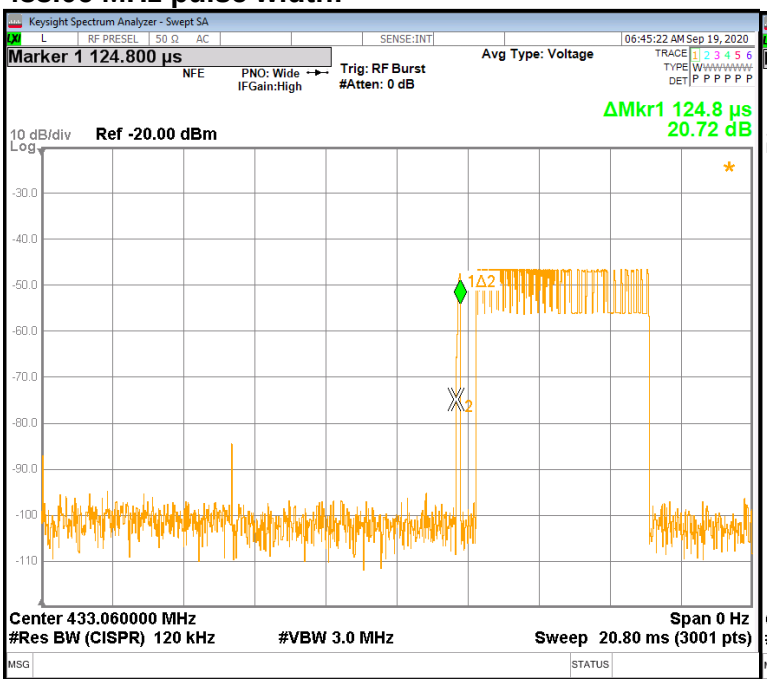


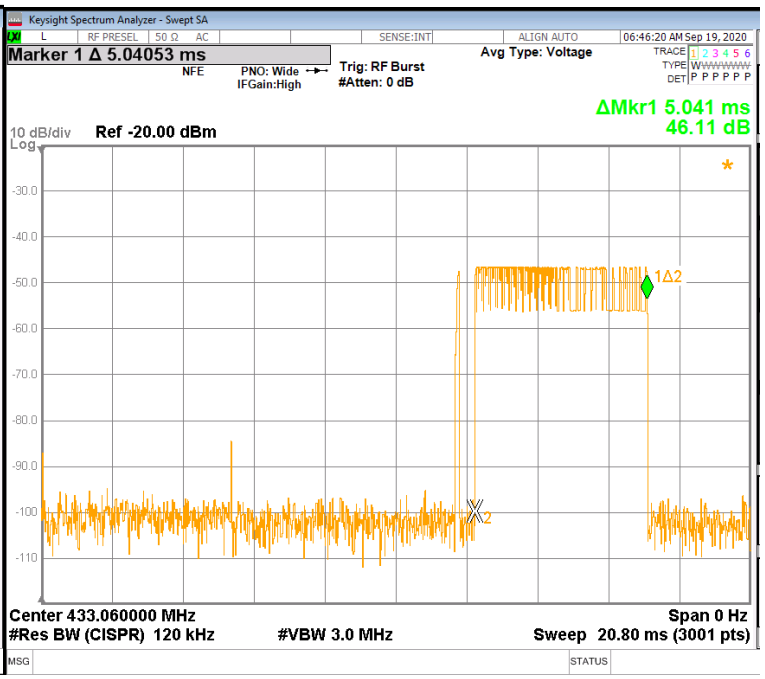


431.06 MHz Duty Cycle:



433.06 MHz pulse width:





433 MHz Duty Cycle:

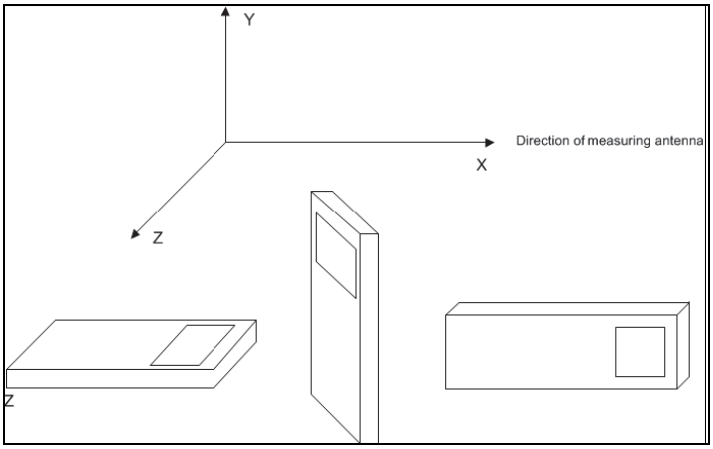
2.5 EUT Positioning Assessment

Test Lab: Electronics Test Centre, Airdrie	**EUT: RF Fob**
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

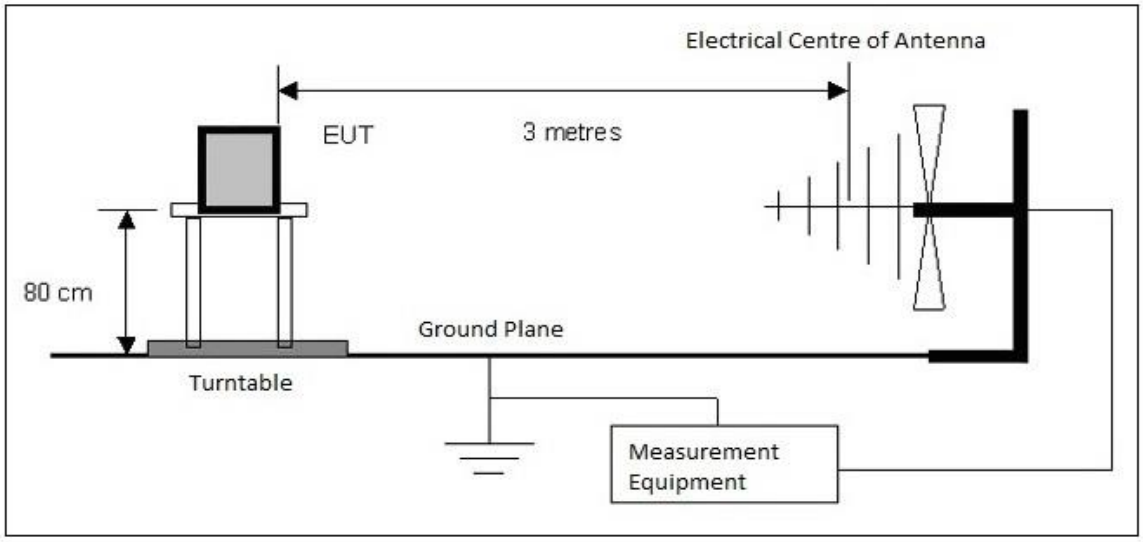
Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
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 made to transmit continuously by test specific software by programming to simulate the continuous press on the button. 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: RF Fob**
Test Personnel: Imran Akram, Janet Mijares	**Standard: FCC Part 15.231**
Date: 2020-09-16/17/18 (20.9° C, 43.1% RH)	**Basic Standard: ANSI C63.10-2013**

EUT status: Compliant

Specification: FCC Part 15.231(b)

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	2,250	67	225	47
70-130	1,250	61.9	125	41.9
130-174	1,250 to 3,750*	61.9 to 71.5*	125 to 375*	41.9 to 51.5*
174-260	3,750	71.5	375	51.5
260-470	**3,750 to 12,500***	**71.5 to 81.9***	**375 to 1,250***	**51.5 to 61.9***
Above 470	12,500	81.9	1,250	61.9

*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

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

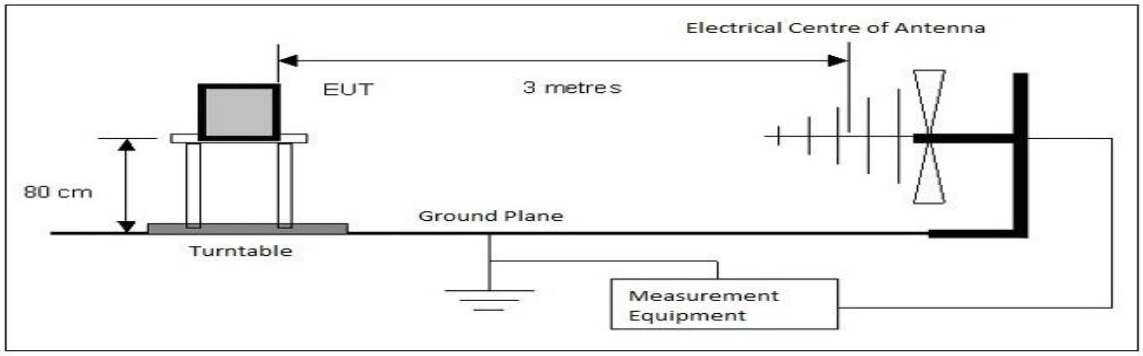
Testing was performed with this equipment:

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 pushing 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.
- Lowest EUT frequency is 24 MHz (MCU clock). No emission higher than 6dB below the limits were reported during the measurement made from 24 MHz to 30 MHz.

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	90.83	20.5	-21	-19.66	90.33	100.73	-10.4	70.67	80.73	-10.06	H
431.06	85.64	20.5	-21	-19.66	85.14	100.73	-15.59	65.48	80.73	-15.25	V
433.06	90.70	20.4	-21	-19.74	90.10	100.80	-10.7	70.36	80.80	-10.44	H
433.06	85.43	20.5	-21	-19.74	84.83	100.80	-15.97	65.09	80.80	-15.71	V

Field Strength of Spurious Emission test result

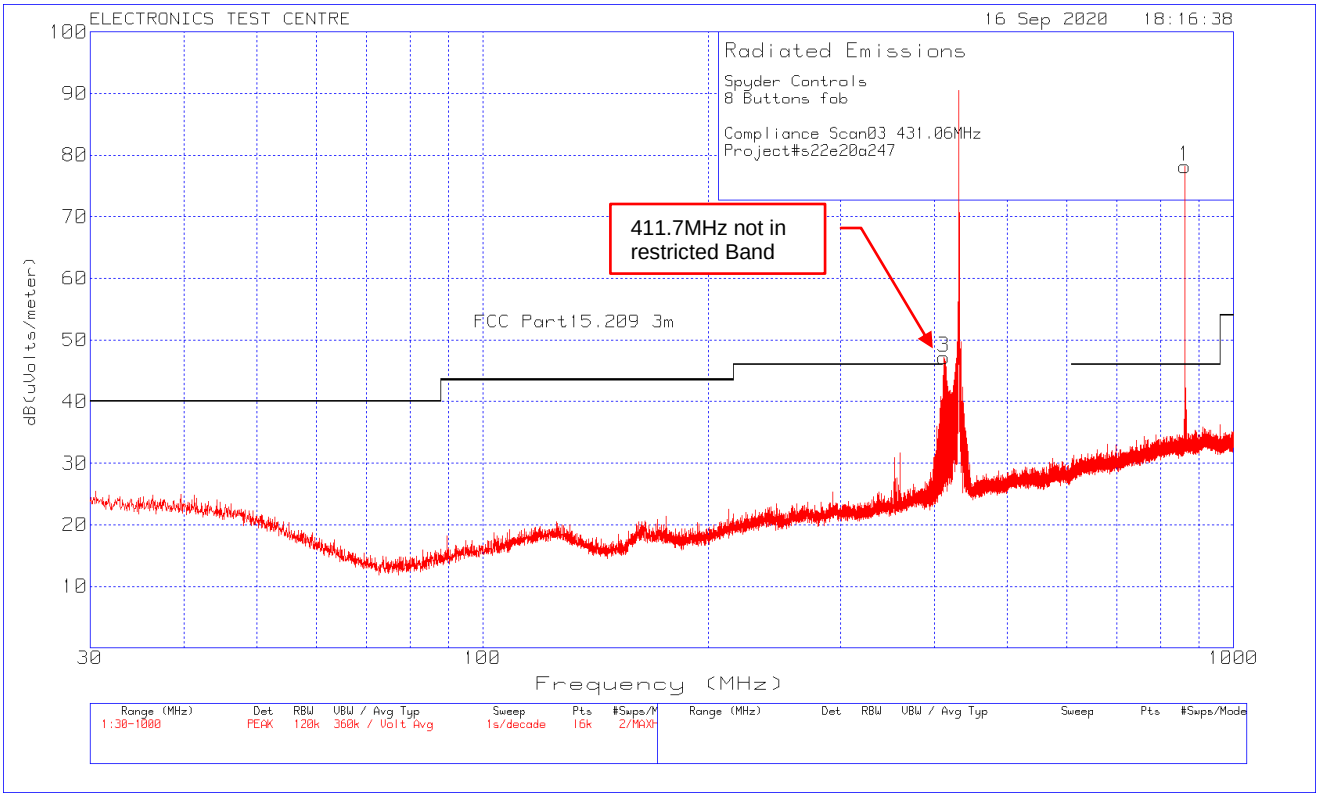
Freq. (MHz)	Raw reading (dBµV)	Antenna Factor (dB/m)	Pre-Amp Gain (dB)	Duty Cycle Correction Factor (dB)	Corrected Peak Field Strength Reading (dBµV/m)	Peak Field Strength Limit (dBµV/m)	Peak Field Strength Margin [dB]	Corrected Average Field Strength Reading (dBµV/m)	Average Field Strength Limit	Average Field Strength Margin [dB]	Polarization
Fundamental TX Frequency: 431.06 MHz											
861.98	71.595	25.4	-18.6	-19.66	78.40	80.73	-2.33	58.74	60.73	-1.99	H
861.93	59.701	26	-18.6	-19.66	67.101	80.73	-13.63	47.44	60.73	-13.29	V
1293.2	73.846	24.8	-29.8	-19.66	68.85	80.73	-11.88	49.19	60.73	-11.54	H
1723.9	71.849	26.7	-27.2	-19.66	71.35	80.73	-9.38	51.69	60.73	-9.04	H
2155.4	62.490	27.6	-26.8	-19.66	63.29	80.73	-17.44	43.63	60.73	-17.1	H
2585.7	57.676	28.8	-26.6	-19.66	59.88	80.73	-20.85	40.22	60.73	-20.51	H
3017.5	56.882	30.2	-25.5	-19.66	61.58	80.73	-19.15	41.92	60.73	-18.81	H
3448.6	52.427	31.3	-25.1	-19.66	58.63	80.73	-22.1	38.97	60.73	-21.76	H
1293.2	65.839	24.8	-29.8	-19.66	60.84	80.73	-18.89	41.18	60.73	-19.55	V
1724.3	64.579	26.8	-27.2	-19.66	64.18	80.73	-16.55	44.52	60.73	-16.21	V
2154.8	61.273	27.6	-26.8	-19.66	62.07	80.73	-18.66	42.41	60.73	-18.32	V
2585.8	57.527	28.8	-26.6	-19.66	59.73	80.73	-21.0	40.07	60.73	-20.66	V
3017.5	51.691	30.2	-25.5	-19.66	56.93	80.73	-23.8	37.27	60.73	-23.46	V
3448.7	54.286	31.3	-25.1	-19.66	60.49	80.73		40.83	60.73	-19.9	V
Fundamental TX Frequency: 433.06 MHz											
866.17	72.252	25.5	-18.5	-19.74	79.25	80.80	-1.55	59.51	60.80	-1.29	H
865.92	59.81	26	-18.5	-19.74	67.31	80.80	-13.49	47.57	60.80	-13.23	V
1732.3	71.98	26.9	-27.1	-19.74	71.78	80.80	-9.02	52.04	60.80	-8.76	H
2164.8	65.53	27.6	-26.9	-19.74	63.23	80.80	-17.57	43.49	60.80	-17.31	V
*3897.8	60.130	32.7	-24.1	-19.74	68.73	80.80	-12.07	48.99	60.80	-11.81	H
*3897.8	60.130	32.7	-24.1	-19.74	68.73	74	-5.27	48.99	54	-5.01	H
4330.7	51.45	32.3	-22.6	-19.74	61.15	80.80	-19.65	41.41	60.80	-19.39	H
*3897.7	45.79	32.7	-24.1	-19.74	54.39	80.80	-26.41	34.65	60.80	-26.15	V
*3897.7	45.79	32.7	-24.1	-19.74	54.39	74	-19.61	34.65	54	-19.35	V
4330.8	49.02	32.3	-22.6	-19.74	58.72	80.80	-22.08	38.98	60.80	-21.82	V

* **Restricted Band**

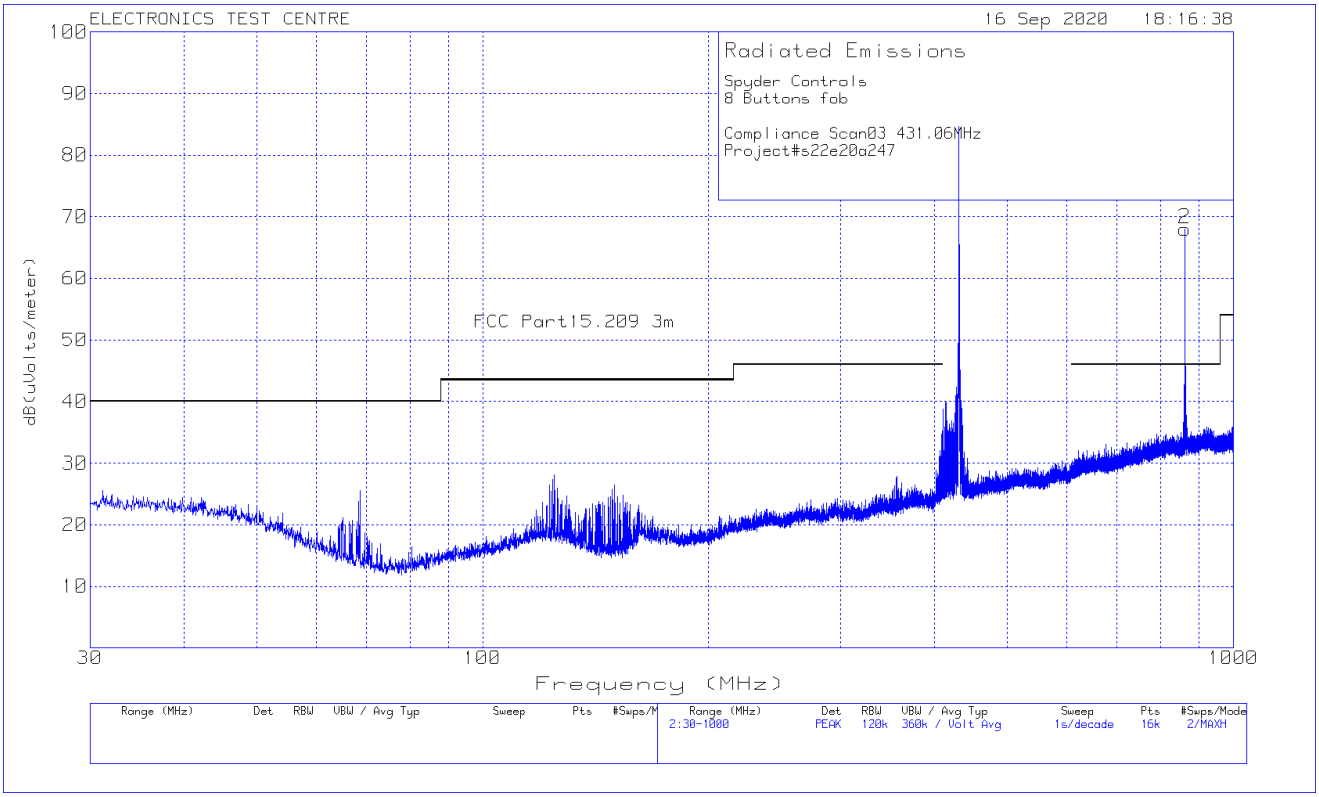
Note: Spectrum analyzer setting for measurement:

- 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)

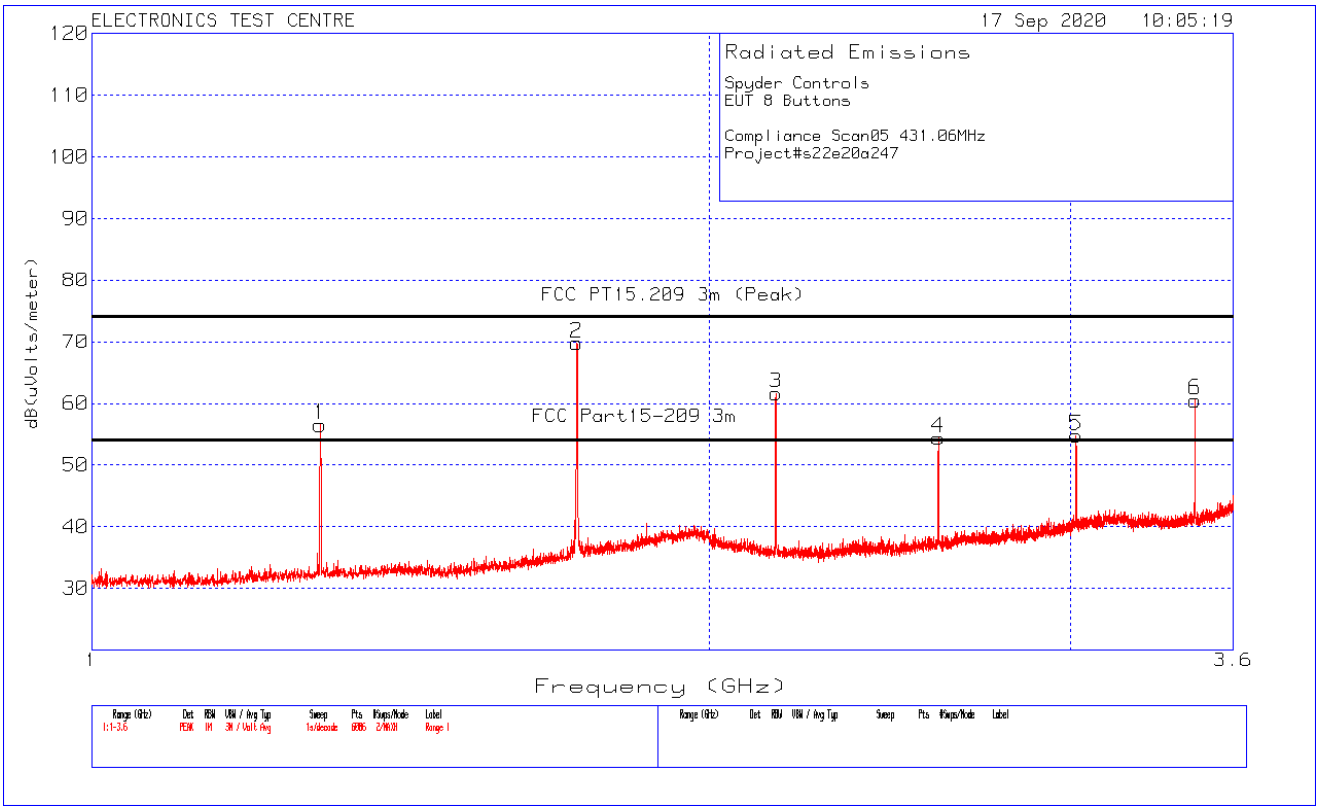
Plot of Radiated Emissions: Horizontal polarization Tx@431.06 MHz



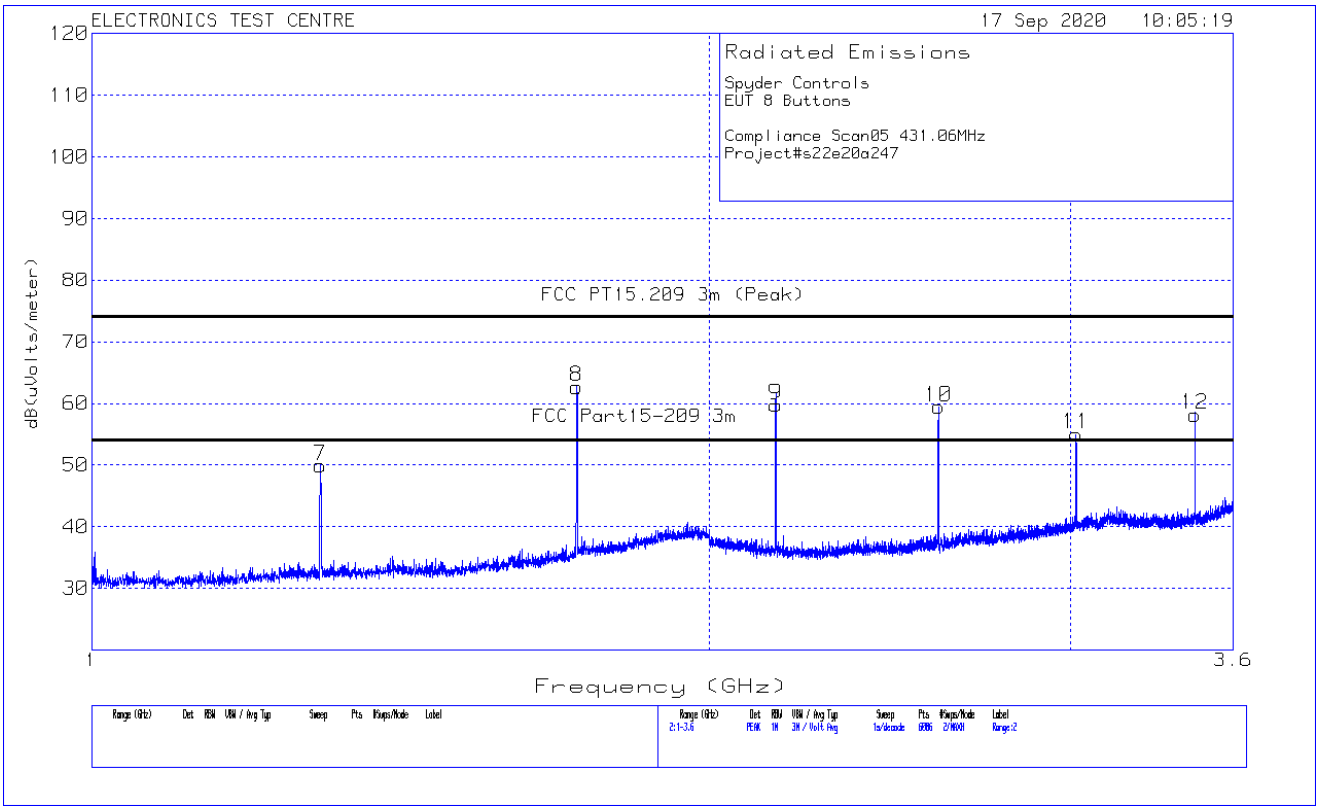
Plot of Radiated Emissions: Vertical polarization TX@431.06 MHz



Plot of Radiated Emissions: Horizontal polarization Tx@431.06 MHz

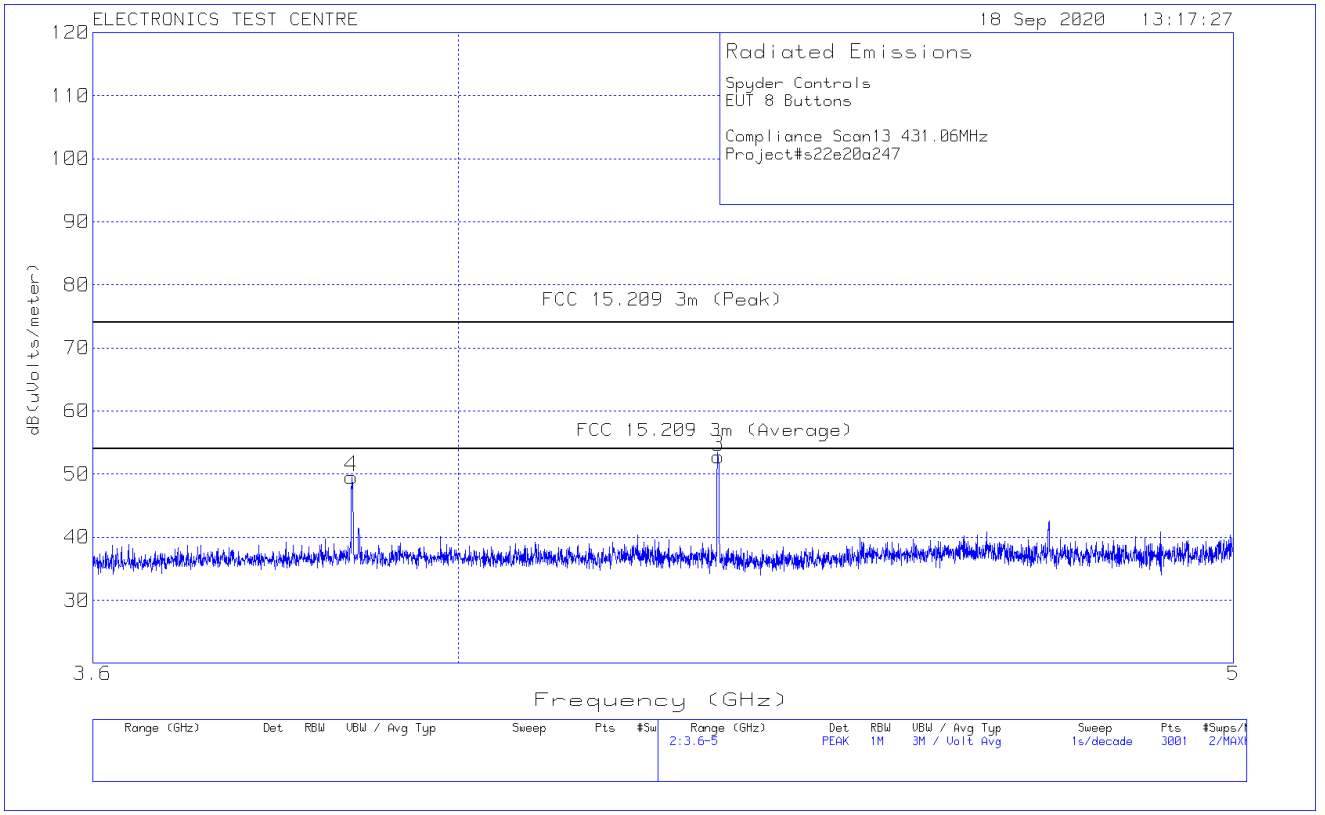


Plot of Radiated Emissions: Vertical polarization TX@431.06 MHz

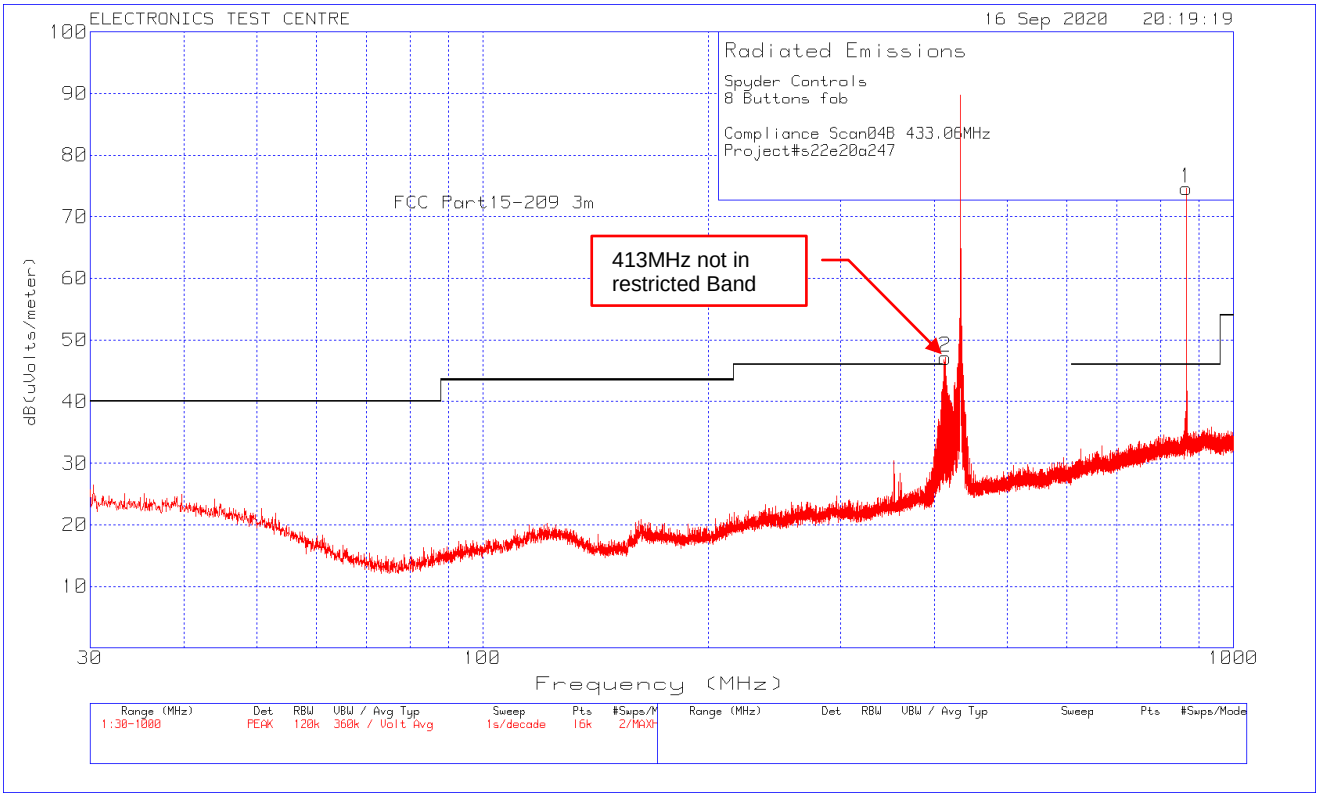


Plot of Radiated Emissions: Horizontal polarization TX@431.06 MHz

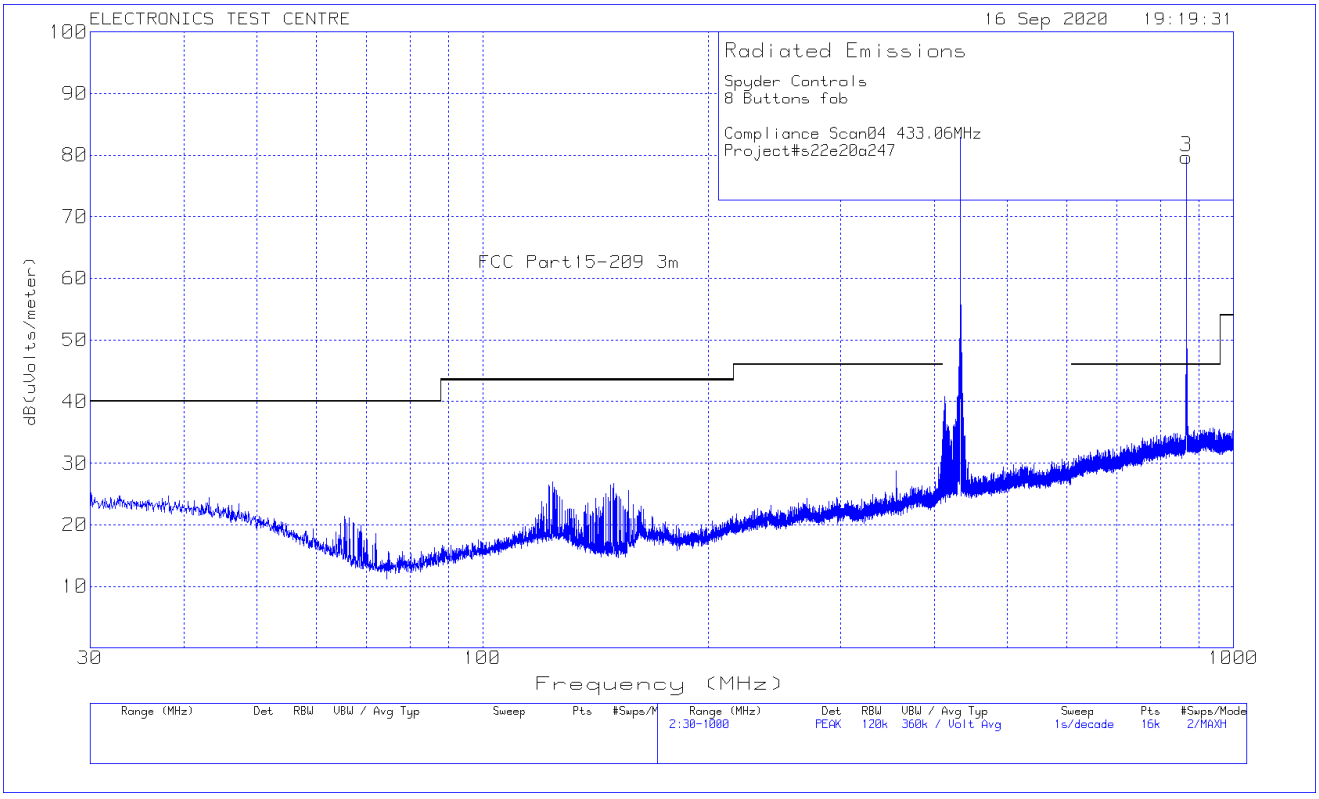
Plot of Radiated Emissions: Vertical polarization TX@431.06 MHz



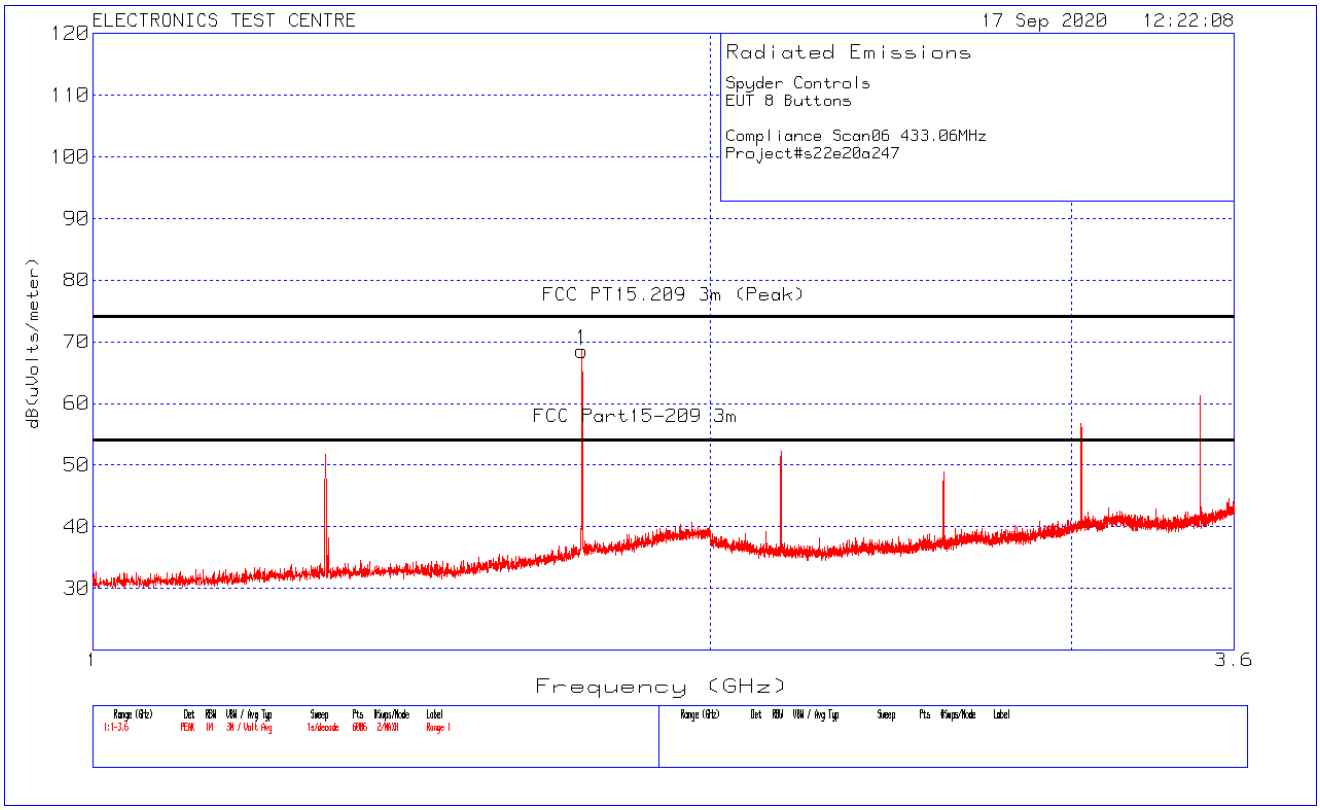
Plot of Radiated Emissions: Horizontal polarization Tx@433.06 MHz



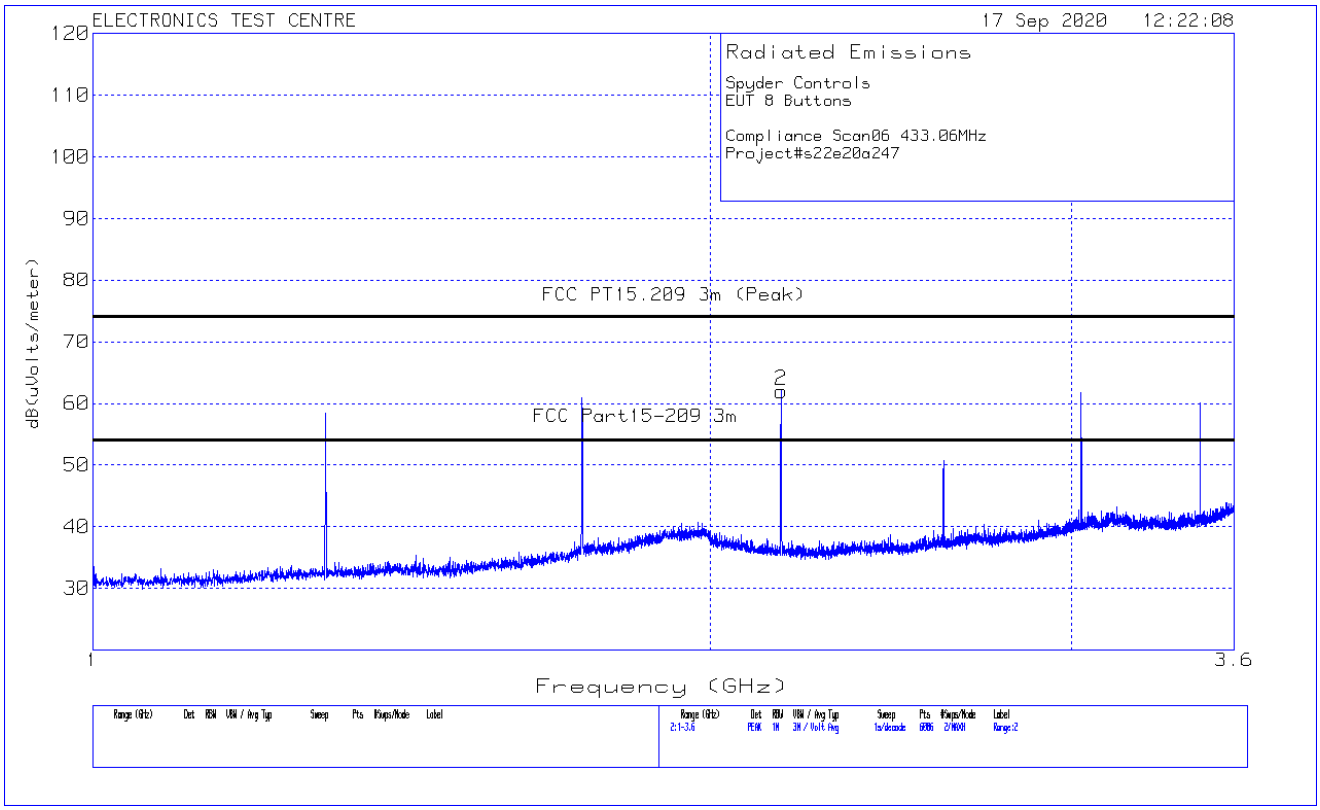
Plot of Radiated Emissions: Vertical polarization TX@433.06 MHz



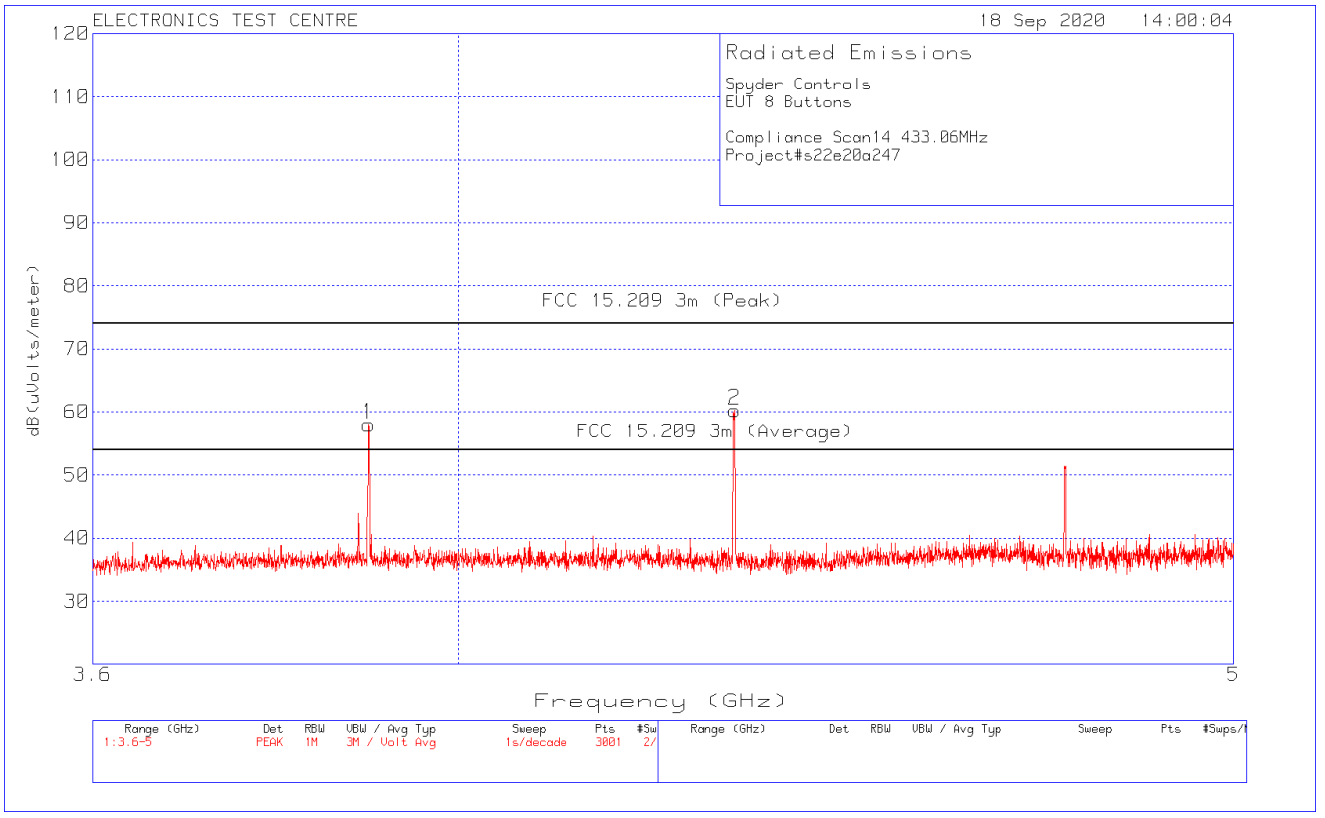
Plot of Radiated Emissions: Horizontal polarization Tx@433.06 MHz



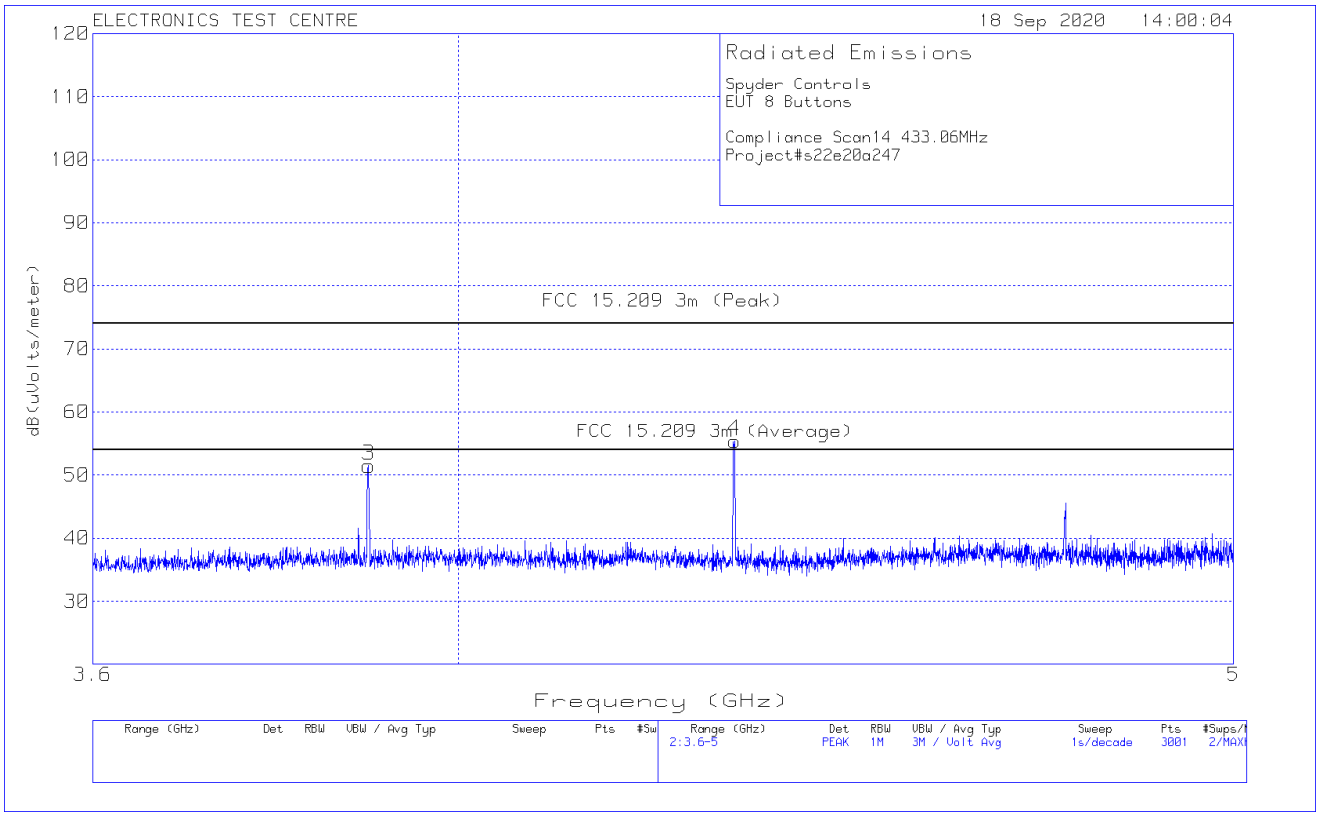
Plot of Radiated Emissions: Vertical polarization TX@433.06 MHz



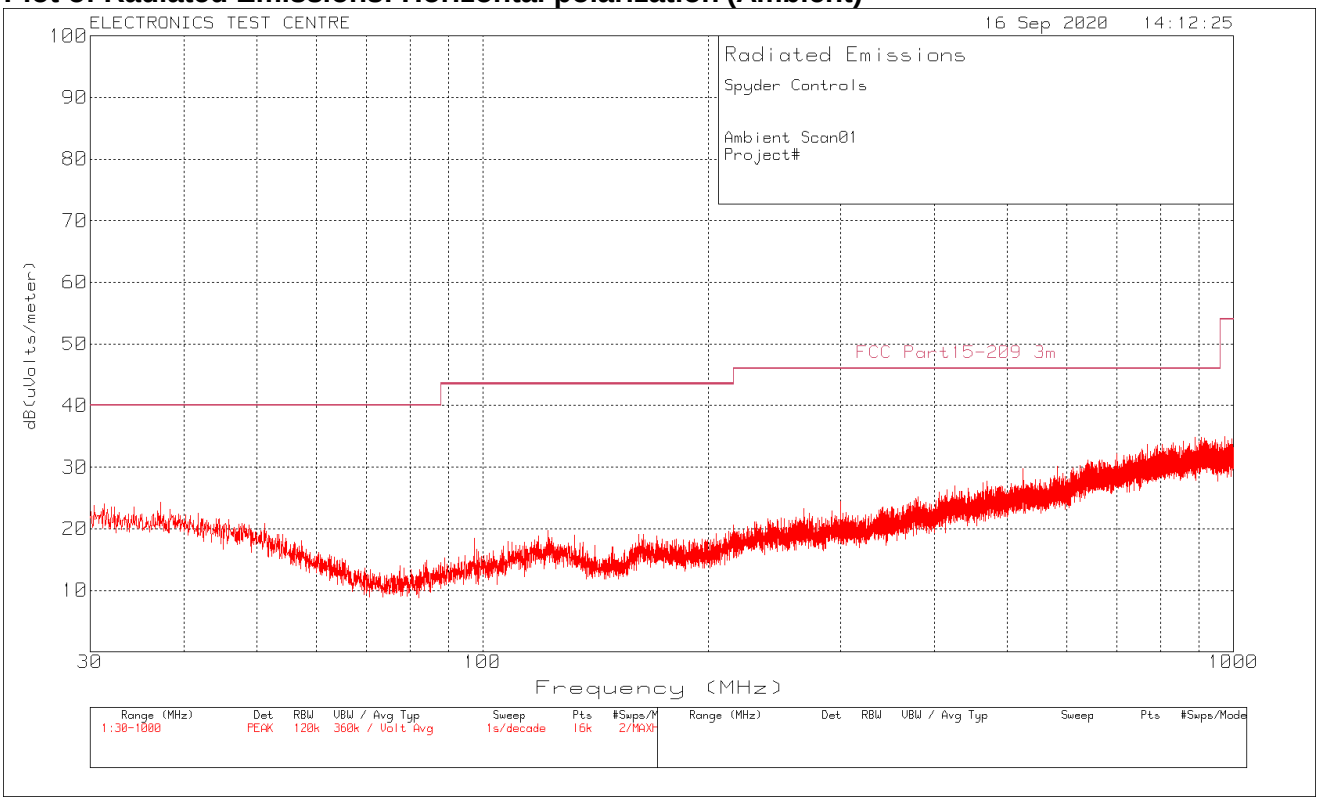
Plot of Radiated Emissions: Horizontal polarization TX@433.06 MHz



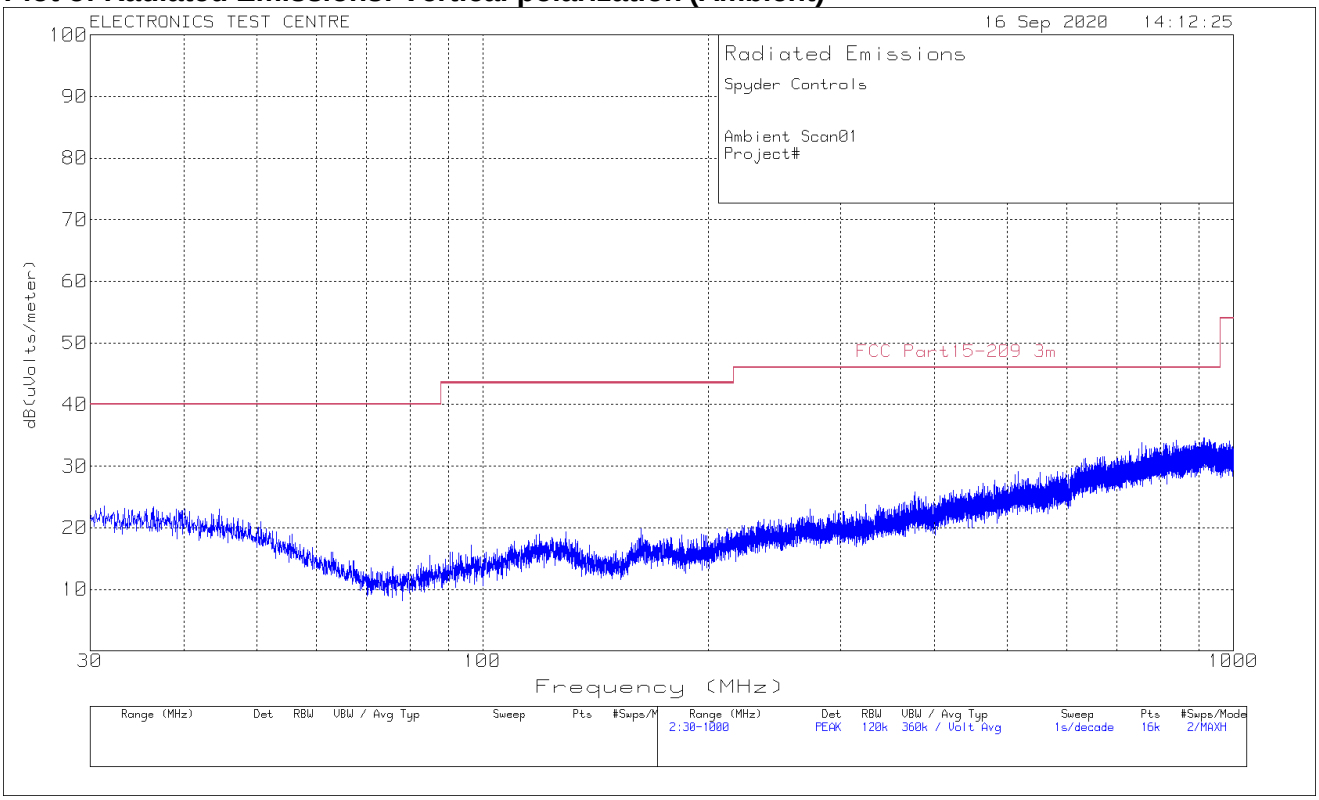
Plot of Radiated Emissions: Vertical polarization TX@433.06 MHz



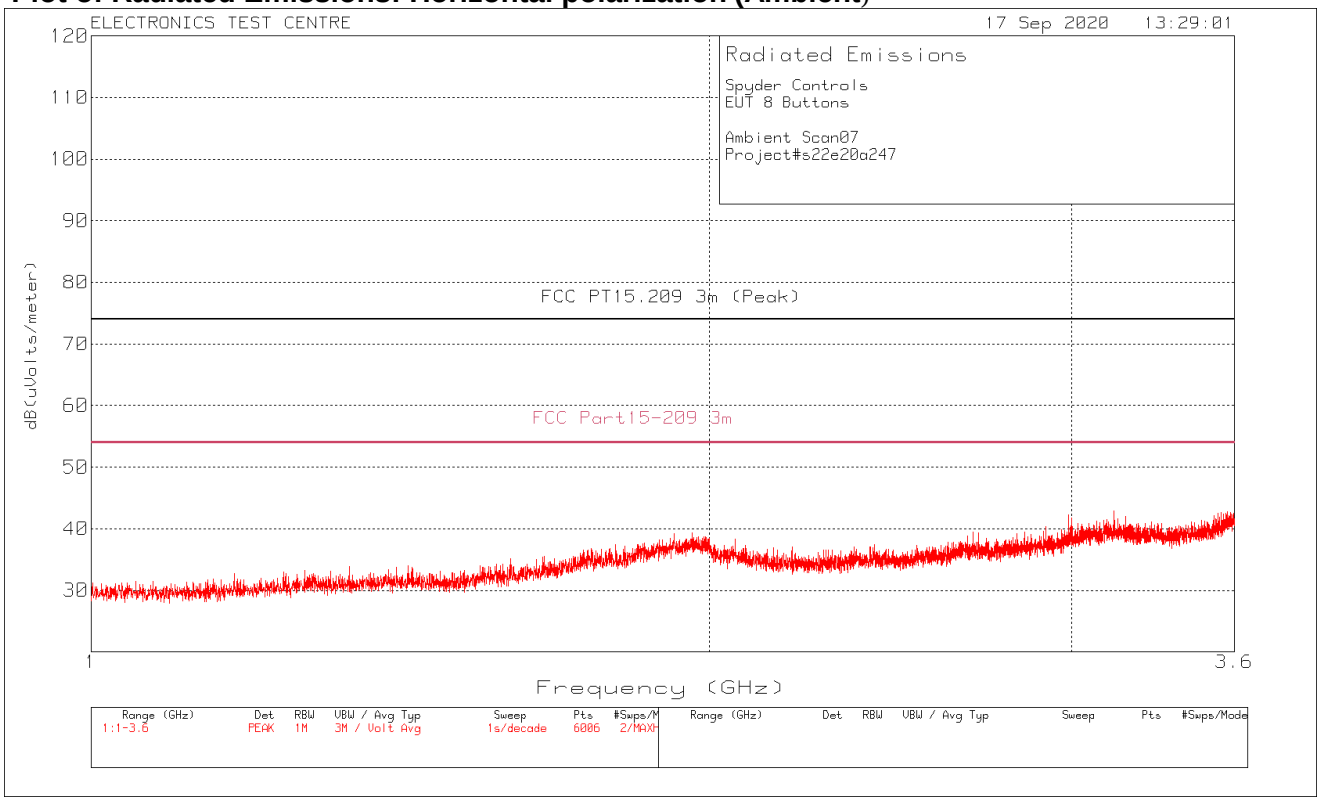
Plot of Radiated Emissions: Horizontal polarization (Ambient)



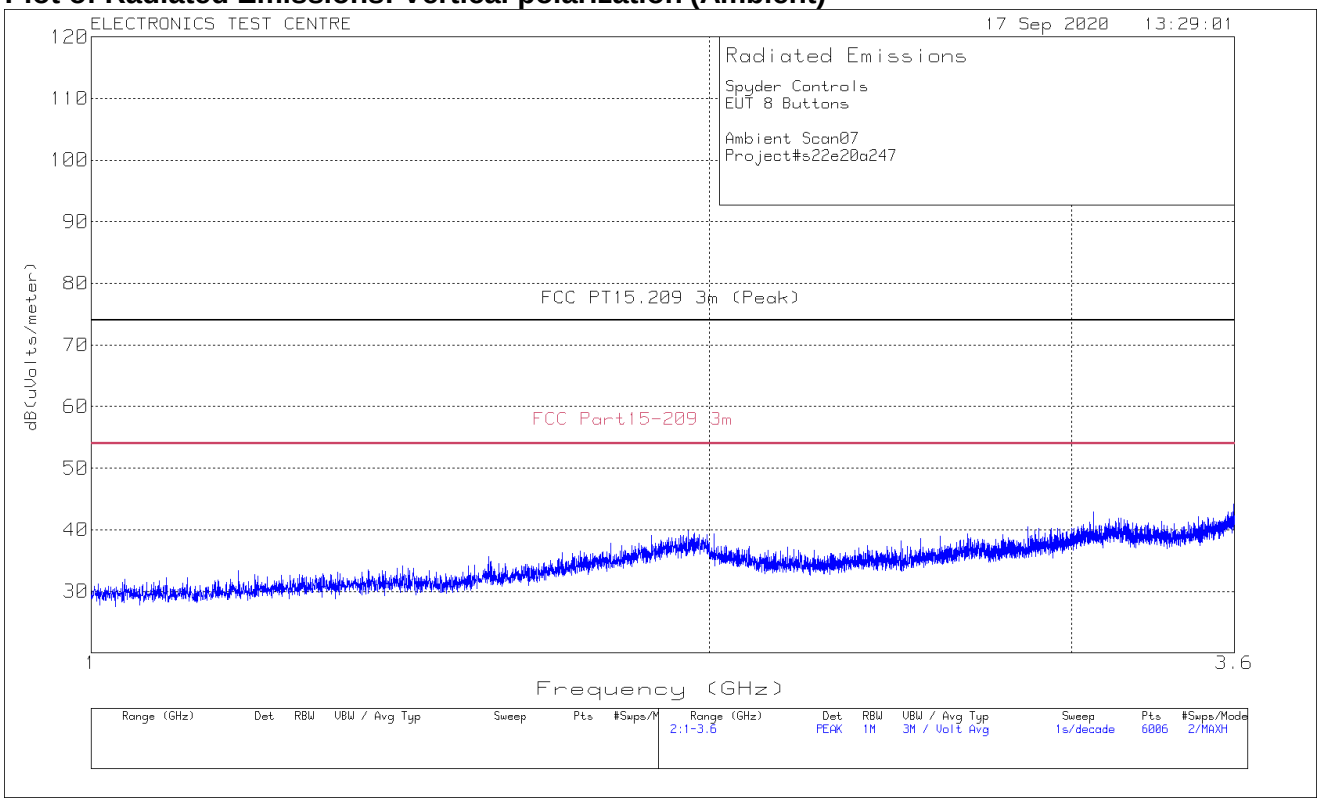
Plot of Radiated Emissions: Vertical polarization (Ambient)



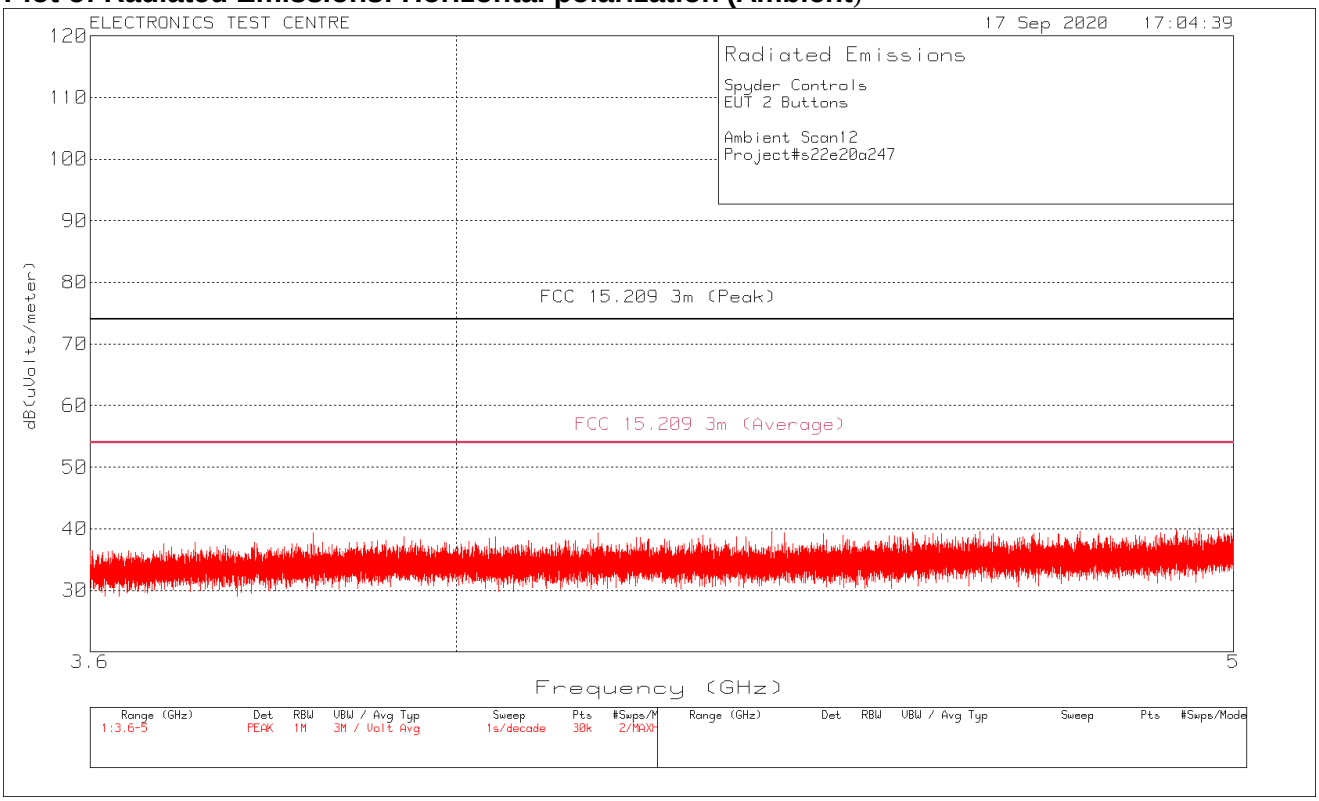
Plot of Radiated Emissions: Horizontal polarization (Ambient)



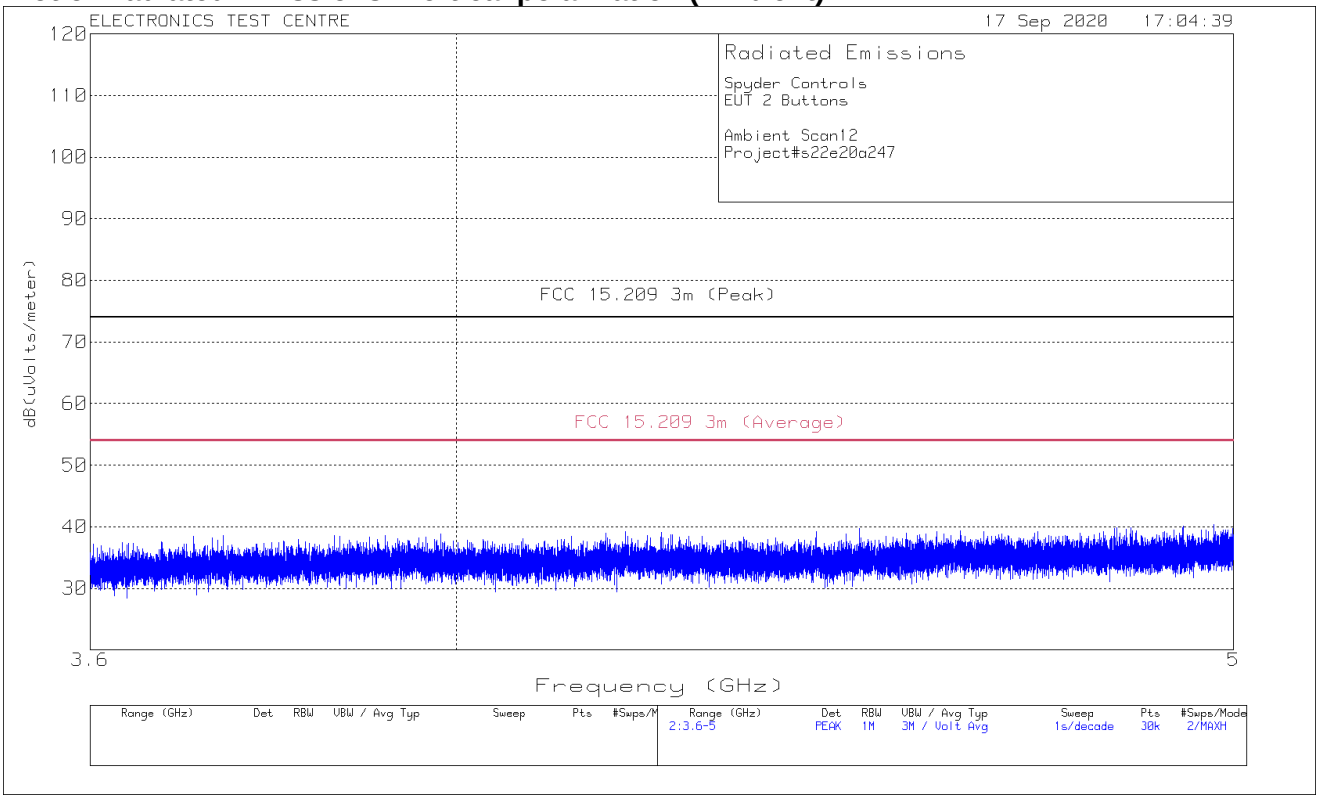
Plot of Radiated Emissions: Vertical polarization (Ambient)



Plot of Radiated Emissions: Horizontal polarization (Ambient)



Plot of Radiated Emissions: Vertical polarization (Ambient)



2.8 RF Exposure

Test Lab: Electronics Test Centre, Airdrie	**EUT: Spyder Controls** **Standard: FCC PART 1.1307(b)(1)**
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.

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