Electromagnetic Compatibility Test Report

Description: RADION Inertia

Model: RF3405E

Bosch Security Systems, Inc.
130 Perinton Pkwy
Fairport, NY, 14450

Prepared by:

TUV Rheinland of North America, Inc.

Client:	Bosch Security Systems, Inc. 130 Perinton Pkwy Fairport, NY, 14450	***Contact:*** ***Tel:*** ***Fax:*** ***e-mail:***	Peter Namisnak 585-223-4060 585-223-9180 peter.namisnak@us.bosch.com
Identification:	RADION Inertia	***Serial No.:***	0001
Test item:	RF3405E	***Date Test Completed:***	09/18/2020
Testing location:	TUV Rheinland of North America 710 Resende Road, Building 199 Webster, NY 14580 U.S.A.	Tel: (585) 645-0125 Fax: -	
Test specification:	**Emissions:** FCC Part 15 Subpart C: Sections 205, 209, and 231; RSS-210; RSS-Gen		
Test Result and/or Conclusion:	The above product was found to be **Compliant** to the above test standard(s)		

Report written/updated by: Alexander Sowinski	***reviewed by:*** Rachana Khanduri
24 September 2020 ***Date*** ***Signature***	24 September 2020 ***Date*** ***Signature***

FC	ilac-MRA A2LA ACCREDITED	VCCI	Industry Canada ISED
5253	**3331.08**	**1097 (A-0329)**	**482B-1**

Revisions

Date mm/dd/yy	Name	Page Number of Change	Describe Change
7/22/2020	Rev.0	N/A	Original Document
9/24/2020	Rev.1	11,17,22,31	Updated Duty Cycle, removed EUT Photos.

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1 General Information

1.1 Scope

This report is intended to document the status of conformance based on the results of testing performed on the RADION Inertia, Model Number: RF3405E, manufactured by Bosch Security Systems, Inc.. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 *Summary of Test Results*

Applicant:	Bosch Security Systems, Inc. 130 Perinton Pkwy Fairport, NY, 14450	**Tel:**	585-223-4060	**Contact:**	Peter Namisnak
		Fax:	585-223-9180	**e-mail:**	peter.namisnak@us.bosch.com

Description:	RADION Inertia	**Model Number:**	RF3405E
Serial Number:	0001	**Test Voltage/Freq.:**	3 VDC
Test Date Completed:	09/18/2020	**Test Engineer:**	Alexander Sowinski

Standards	Description	Severity Level or Limit	Measured	Test Result
FCC Part 15 Subpart C; FCC Part 15.231; RSS-210; RSS-Gen	Radiated Emission Requirements: Intentional Radiators. Periodic Operation in the band 40.66-40.70 MHz and above 70 MHz	See Subparts Below	See Below	**Complies**
FCC Part 15.231(a); RSS-210 A.1.1	Deactivation of Transmitter	Within 5 seconds of activation	< 2 sec.	**Complies**
FCC Part 15.231(a); RSS-210 A.1.1	Duty Cycle	No more than 2 seconds per hour (0.056%)	0.017%	**Complies**
FCC Part 15.231(b); RSS-210 A.1.2	Field strength of fundamental and spurious emissions	Peak Limit of Fundamental: 80.8 dBuV/m Peak Limit of Spurious: 60.8 dBuV/m	79.6 dBµV/m 40.6 dBµV/m	**Complies**
FCC Part 15.231(c); RSS-210 A.1.3	20 dB Bandwidth	Bandwidth < 1.083 MHz	247.80 kHz	**Complies**
RSS-Gen 6.7	99% Bandwidth	Bandwidth < 1.083 MHz	210.76 kHz	**Complies**
RSS-Gen 6.11 & 8.11	Frequency Stability	Within central 80% of Frequency band	Within Limits	**Complies**

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at, 710 Resende Road Webster, NY 14580 is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 5253). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

2.1.2 ILAC/A2LA

This is a program which is administered under the auspices of A2LA. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2017 (Certificate Number: 3331.08). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 VCCI

VCCI Accredited test lab. Registration numbers A-0329.

2.1.4 Industry Canada

(Registration No.: 482B-1) The 10 meter Semi-Anechoic chamber has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2014.

2.1.5 BSMI

Registration No.: SL2-IN-E-1159R. The BSMI accreditation was obtained by NIST MRA with the BSMI.

2.1.6 Korea

(Designation No.: US0192). Recognized by National Radio Research Agency (RRA) as an accredited Conformity Assessment Body (CAB) under the terms for Korea Phase I of the APEC TEL.

2.2 Test Software

1) CIGUI 32 Version 1.4 for California Instruments AC power source
2) HP software E7415A Version A.01.45
3) National Instruments 'Measurement & Automation Employer' Version 4.6.2f1
4) TILE version 3.4.K.28
5) Voltech PM 6000 Firmware 1.22.07RC6, Software IEC61000-3 for PM6000 Release 1.24.12
6) California Instruments AC power source MXHCL
7) Rohde & Schwarz EMI Measurement software EMC32 version 8.50.0
8) TILE version 4.0.B
9) Keytek CEWare 2.10

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	Ulab	Ucispr
Radiated Disturbance @ 10m		
30 MHz – 1,000 MHz	4.57 dB	5.2 dB
Radiated Disturbance @ 3m		
1.0 GHz – 6.0 GHz	5.18 dB	5.2 dB
6.0 GHz – 18.0 GHz	5.48 dB	5.5 dB
18.0 GHz – 26.5 GHz	5.21 dB	
26.5 GHz – 40.0 GHz	4.99 dB	
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.62 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.88 dB	4.5 dB

Measurement Uncertainty Emissions

The estimated combined standard uncertainty for radiated emissions measurements is ± 4.57 dB	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements from 1 GHz to 6 GHz is ± 5.18dB	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for radiated emissions measurements from 6 GHz to 18 GHz is ± 5.48dB	Per CISPR16-4-2 Method
The estimated combined standard uncertainty for conducted emissions measurements is ± 2.62dB.	Per CISPR16-4-2 Method

Expanded measurement uncertainty numbers are shown in the tables above. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard ISO IEC 17025:2017. Equipment calibration records are kept on file at the test facility.

2.5 Measurement Equipment Identification

Equipment	Manufacturer	Model #	Ref.	Serial #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Radiated Emissions							
Receiver (2Hz-44GHz)	Rohde & Schwarz	ESW44		101880	15-Oct-19	15-Oct-20	RE
Receiver (Radio)	Rohde & Schwarz	ESU		100274	29-Jul-19	29-Sept-20	RE
BiLog	Sunol	JB3		A102115	27-Jun-18	27-Sept-20	RE
Horn(1-18 GHz)	ETS-Lindgren	3117		109306	20-Aug-18	20-Sept-20	RE
Loop Antenna	EMCO	6502		0004-3336	26-Feb-20	26-Feb-22	RE
Amplifier (30-1000)	Hewlett-Packard	8447D		0001	30-Jul-19	30-Sept-20	RE
Notch Filter (433 MHz)	Eagle	240NFNM		--	No Cal	No Cal	RE
Temperature Chamber	Cincinnati Sub-Zero	ZPHE-16-2-H/AC		ROC031	2-Sep-19	2-Oct-20	RE
General Laboratory Equipment							
Multimeter	Fluke	87		59890224	1-Aug-19	1-Aug-20	
Pressure/Temperature/RH	Control Company	68000-49		181704893	31-Oct-18	31-Oct-20	

Note: RE=Radiated Emissions

3 Product Information

3.1 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in Appendix A of this report.

3.2 EUT Photos

Per the confidentiality agreement with the client, all setup photos have been removed from this report. All photos have been moved to the document "32062580.001 Test Setup Exhibit".

Figure 1 – External Photo of EUT

Figure 2 – External Photo of EUT

Figure 3 – Internal Photo of EUT

Figure 4 – Internal Photo of EUT

Figure 5 – Internal Photo of EUT

4 Emissions

4.1 Deactivation of Transmitter

This test confirms that the periodic transmission deactivates within 5 seconds of activation

4.1.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	09/18/2020
Standard	FCC Part 15.231(a); RSS-210 A.1.1						
Product Model	RF3405E			**Serial#**	0001		
Configuration	See test plan for details						
Test Set-up	Tested in a shielded room, EUT placed on workbench						
EUT Powered By	3 VDC	**Temp**	22º C	**Humidity**	54%	**Pressure**	997 mbar
Frequency	433.42 MHz Transmitter						
Perf. Criteria	TX off within 5 sec.			**Perf. Verification**	Measurement Under Limit		
Mod. to EUT	None			**Test Performed By**	Alexander Sowinski		

4.1.2 Test Procedure

Per FCC 15.231(a)(2) "A transmitter activated automatically shall cease transmission within 5 seconds after activation."

The EUT was placed on a workbench and a zero-span transmission was recorded. The supervisory message was observed to end **within 1 second** of the start of transmission. The alarm message was observed to end **within 2 seconds** of the start of a transmission.

4.1.3 Final Test

The transmitter shut-off time was observed to be in compliance with the limit specified.

4.1.4 Test Data

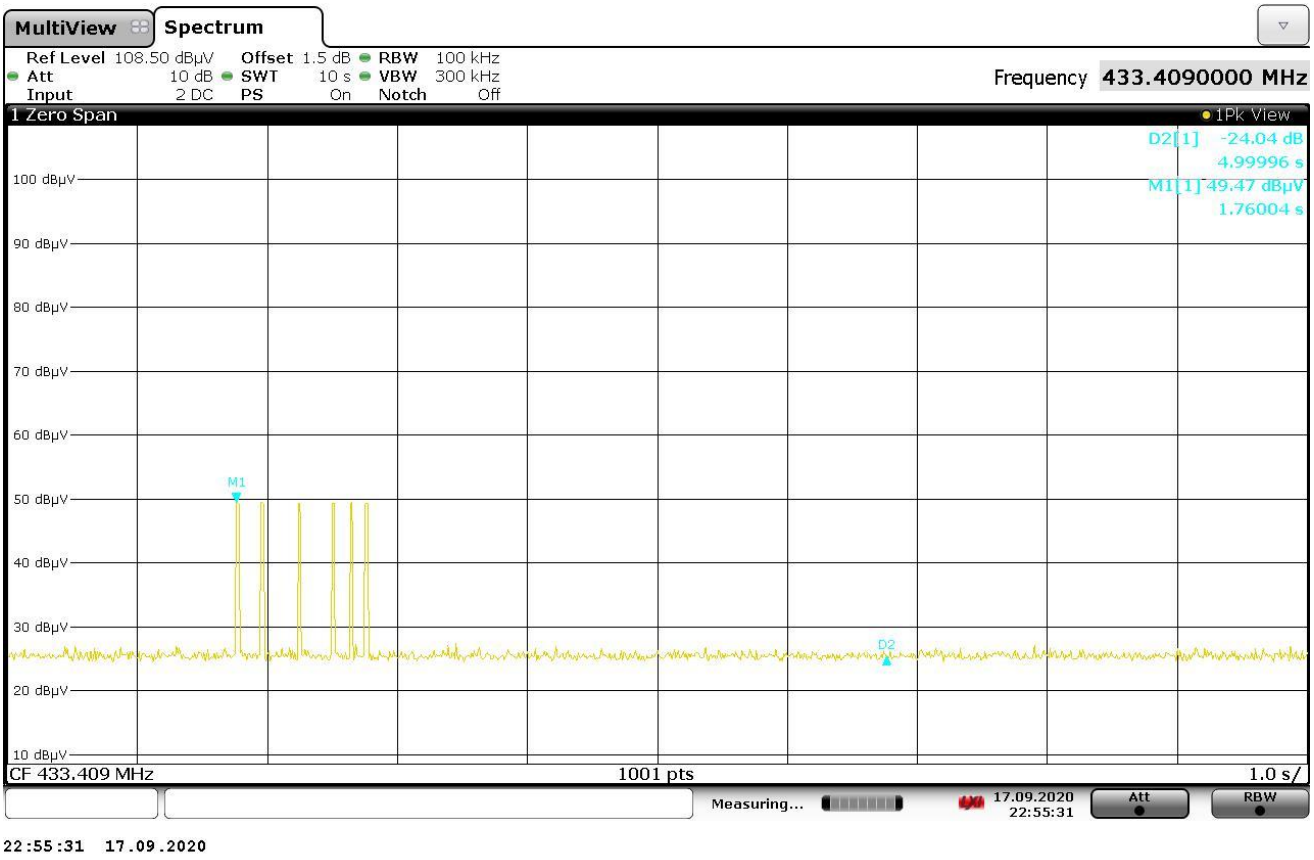


Figure 6 – Supervisory Message TX deactivation

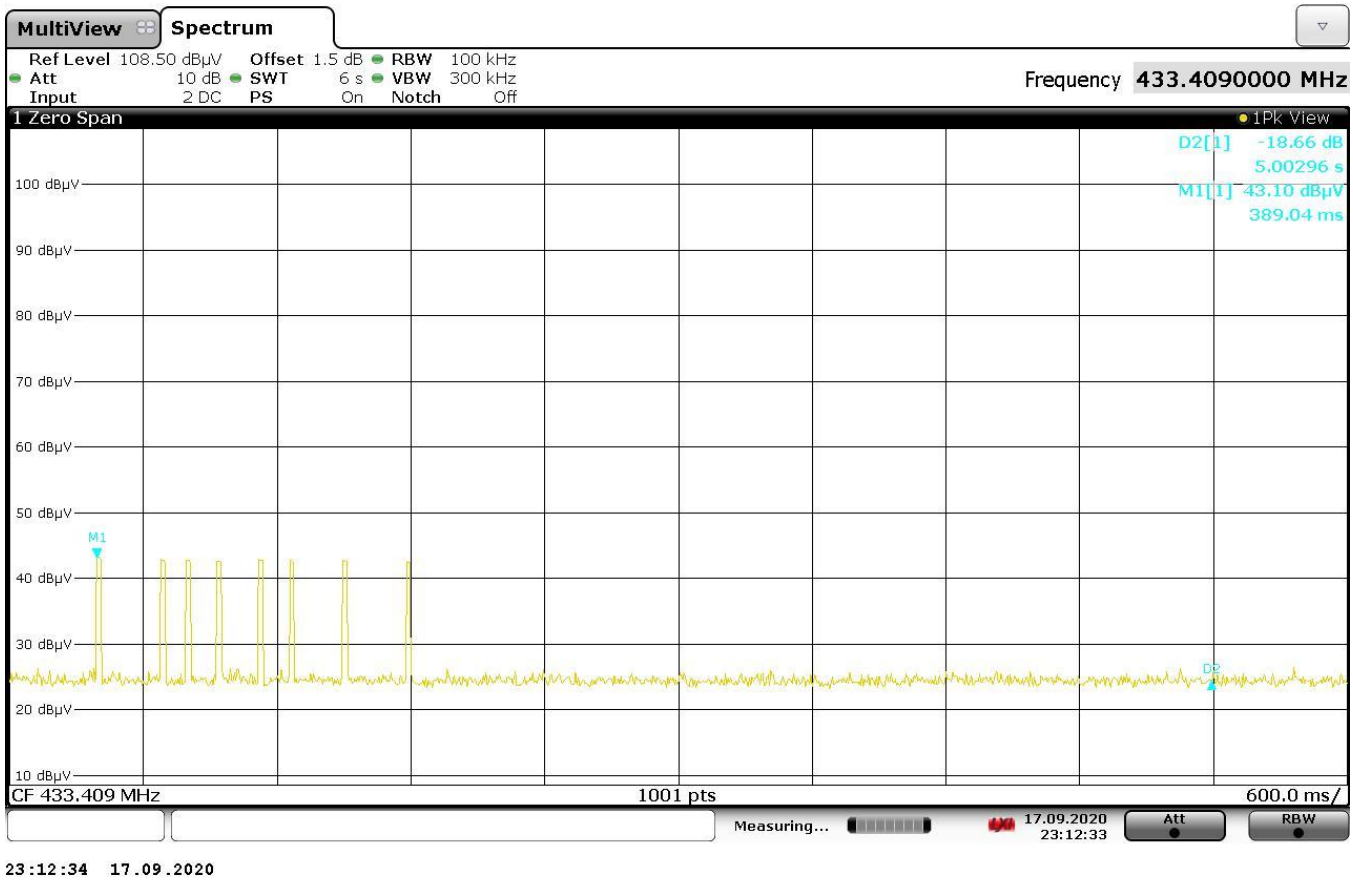


Figure 7 – Alarm Message TX deactivation

4.2 Duty Cycle

This test measures the ratio of the transmit on-time to the transmit off-time.

4.2.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	09/18/2020
Standard	FCC Part 15.231(a); RSS-210 A.1.1						
Product Model	RF3405E			**Serial#**	0001		
Configuration	See test plan for details						
Test Set-up	Tested in a shielded room, EUT placed on workbench						
EUT Powered By	3 VDC	**Temp**	22° C	**Humidity**	54%	**Pressure**	997 mbar
Frequency	433.42 MHz Transmitter						
Perf. Criteria	Duty cycle < 0.056%			**Perf. Verification**	Measurement Under Limit		
Mod. to EUT	None			**Test Performed By**	Alexander Sowinski		

4.2.2 Test Procedure

The limit for duty cycle is described in FCC 15.231(a) as follows:
"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."

A total on-time of 2 seconds over the period of 1 hour equates to a duty cycle of (2/3600)*100 = 0.056%

The EUT transmits supervisory messages every 13 minutes. In the default state, each message consists of six 16 ms packets spread over a minimum of 696 ms. In the event an alarm event occurs, a message consisting of eight 16 ms packets spread over 2 seconds is sent immediately, with the next supervisory message being sent 13 minutes after the alarm. Taking an alarm event as worst-case, at most over the course of an hour there could be 1 alarm message interrupting a sequence of 5 supervisory messages at 13 minute increments. This yields a maximum possible on-time over a period of 1 hour of:

[(6*16)*5 + (8*16)] = **608 ms**

Thus the long-term duty cycle of the EUT can be expressed as:

[736/3600000]*100 = **0.017%**

The short-term duty cycle of the EUT when considering an individual message is [(8*16)/(2*3600)]*100 = 1.78% for alarm messages or [(6*16)/696]*100 = 13.79% for supervisory messages.

4.2.3 Final Test

The duty cycle of the periodic transmitter is within the specified limit.

4.2.4 Test Data

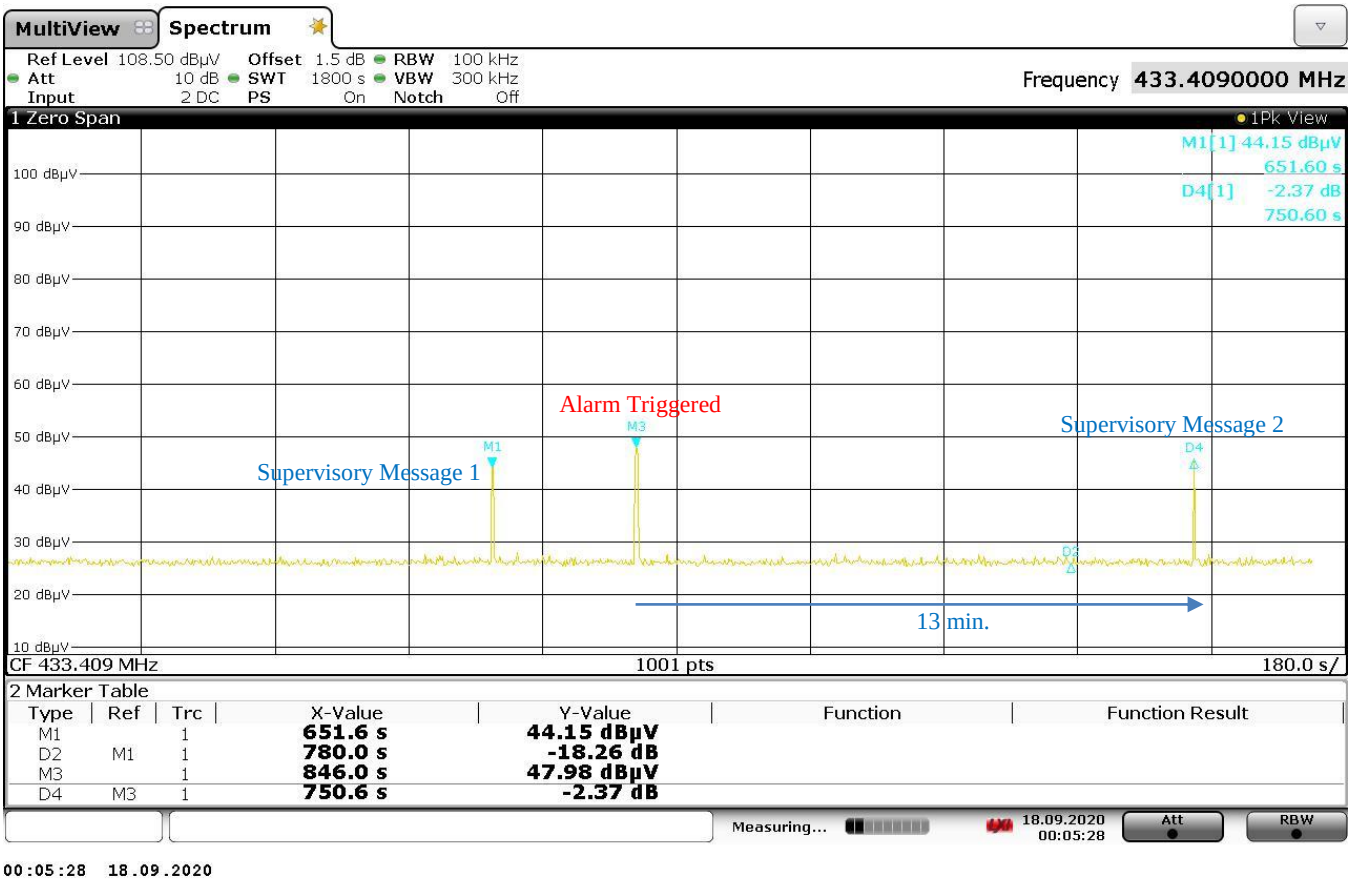


Figure 8 – Alarm event during normal operation

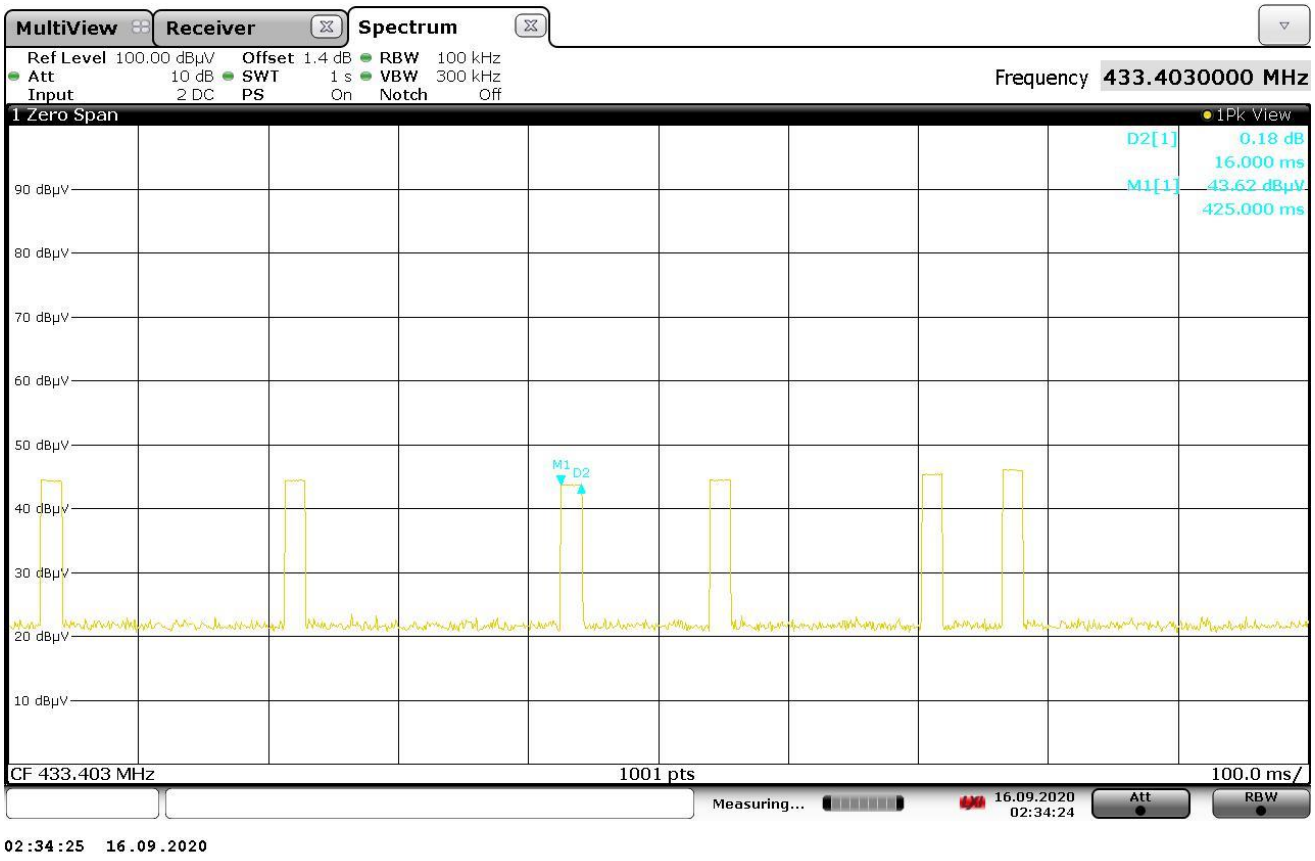


Figure 9 – Supervisory Message Duty Cycle

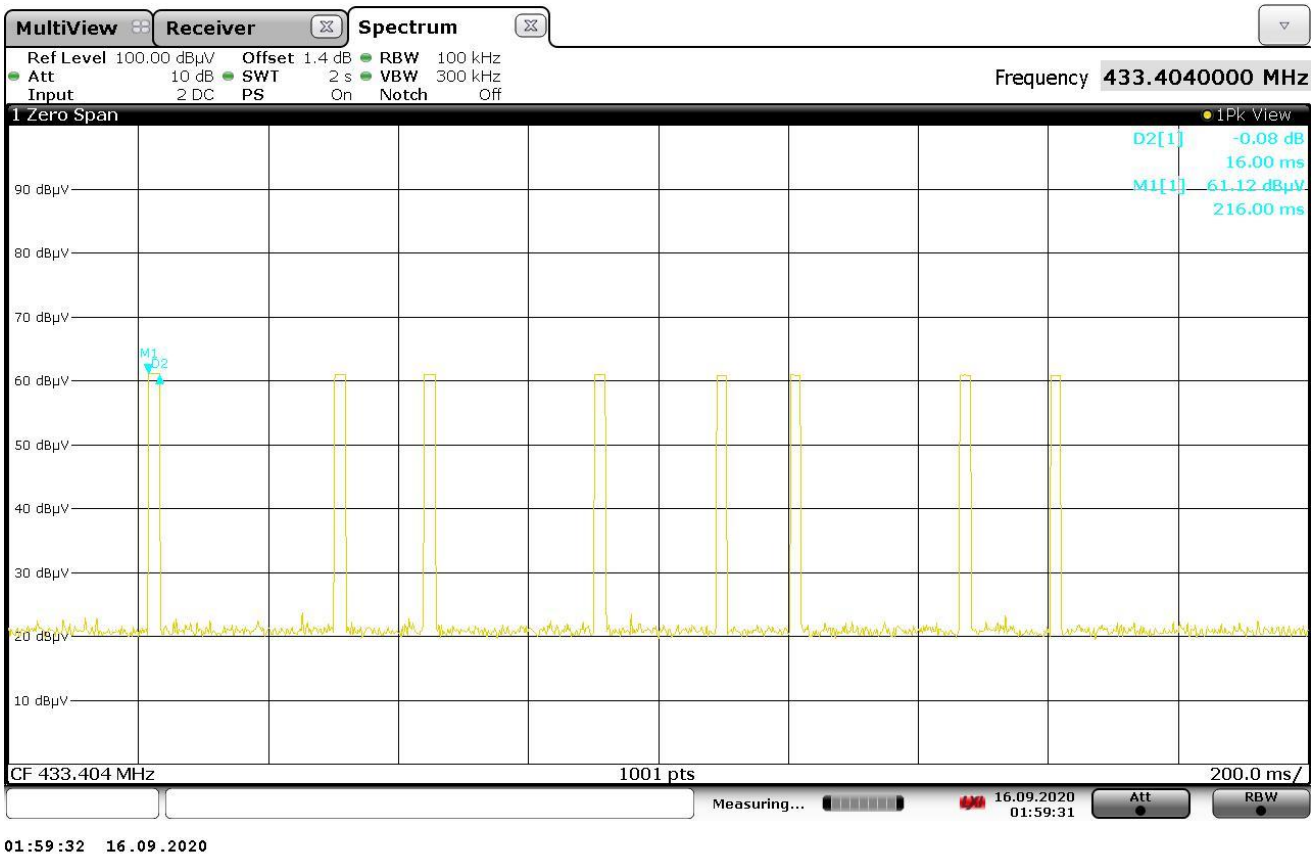


Figure 10 – Alarm Message Duty Cycle

4.3 Field Strength of Fundamental and Spurious Emissions

This test measures the electromagnetic levels of the fundamental transmission frequency and its associated harmonics.

4.3.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	06/25/2020
Standard	FCC Part 15.231(b); RSS-210 A.1.2						
Product Model	RF3405E			**Serial#**	0001		
Configuration	See test plan for details.						
Test Set-up	Tested at 3 meters in a semi-anechoic chamber, EUT placed on turntable. See test plans for details.						
EUT Powered By	3 VDC	**Temp**	22° C	**Humidity**	57%	**Pressure**	995 mbar
Frequency Range	Fundamental @ 433.42MHz Harmonics measured to 10th @ 4.3342 GHz						
Perf. Criteria	Fundamental < 80.8 dBµV/m @ 3m Spurious < 60.8 dBµV/m @ 3m (Below Limit)			**Perf. Verification**	Readings Under Limit		
Mod. to EUT	None			**Test Performed By**	Alexander Sowinski		

4.3.2 Test Procedure

The EUT was placed on the turntable at 80 cm from the reference ground place and 3 meters form the measurement antenna. All three orthogonal orientations were investigated for the highest field strength and spurious emissions. The fundamental frequency of the EUT is given to be 433.42MHz, so in addition to the requirements set by FCC 15.205 and FCC 15.209, the requirements of FCC 15.231(b) were also considered:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

4.3.3 Deviations

Given the low (<60%) Duty Cycle of the unit, a Duty Cycle correction factor is applied to the fundamental and harmonic measurements. The correction factor is $\delta = 20*\log(\Delta)$, thus $\delta = 20*\log(0.1379) =$ **-17.21 dB**

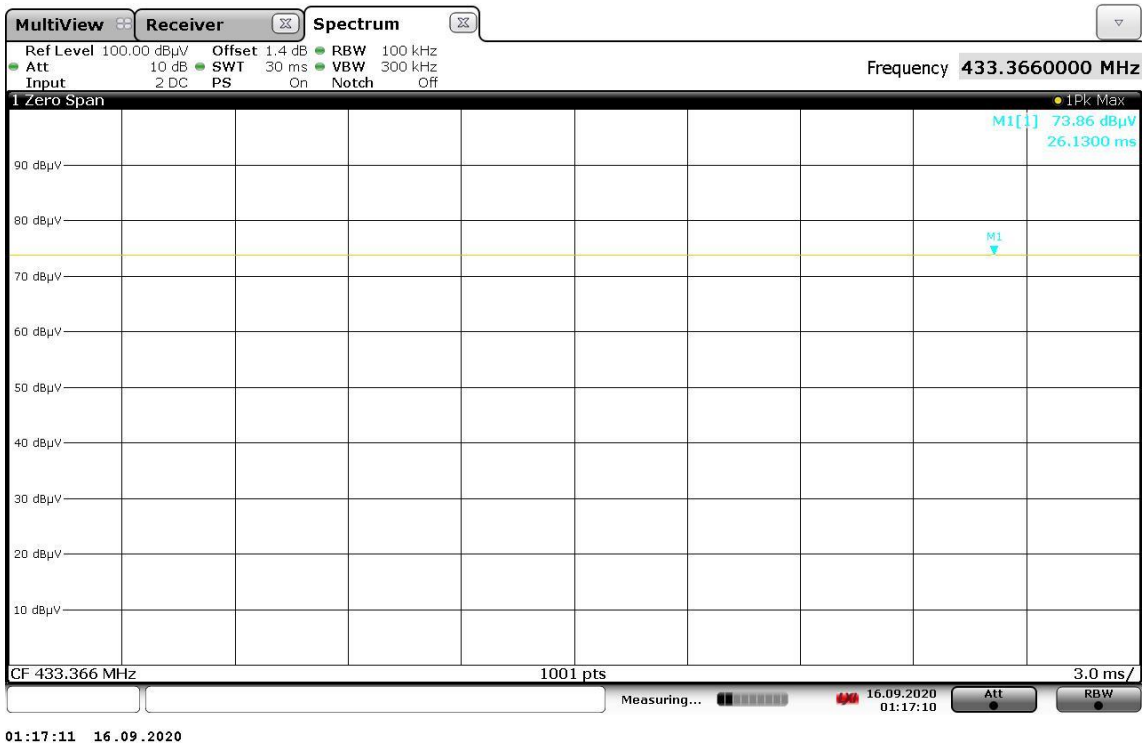
4.3.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

4.3.5 Final Graphs

NOTES: Fundamental Zero-Span, CW mode

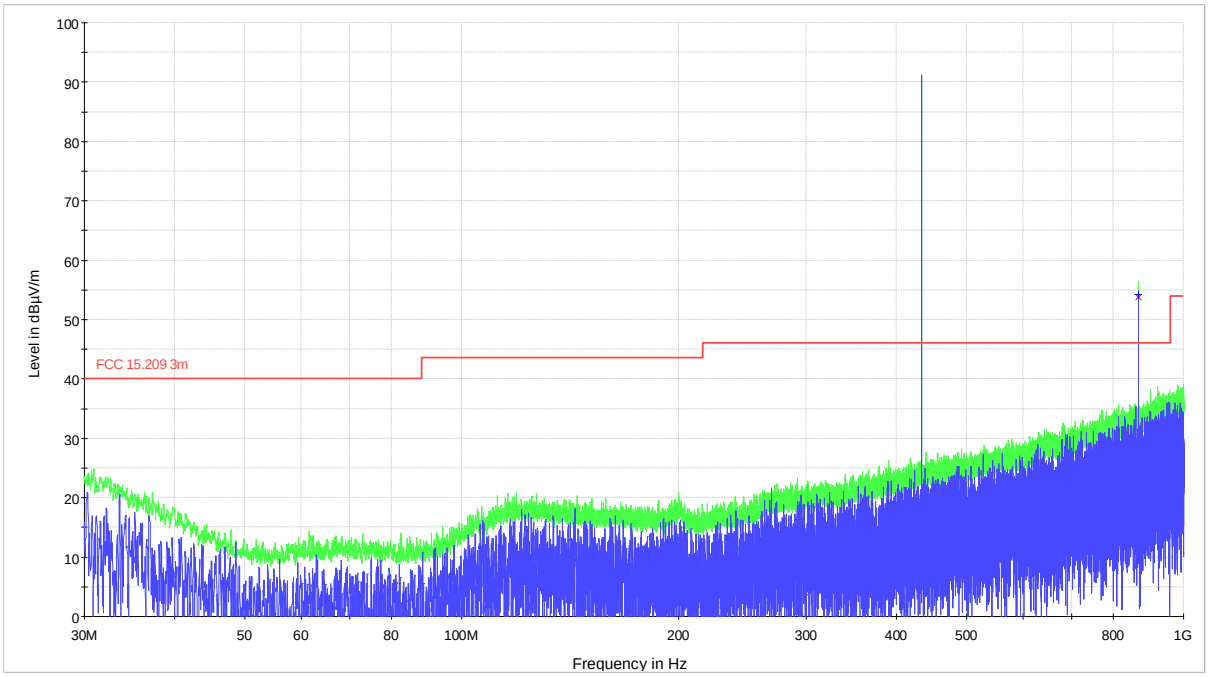
Radiated Emissions
Worst Case: EUT X-axis, Antenna Horz.



Corrected Receiver Voltage: 73.86 dBµV
Electric Field Conversion: 73.86 + 20log(433.366) - 29.8 = **96.797 dBµV/m**

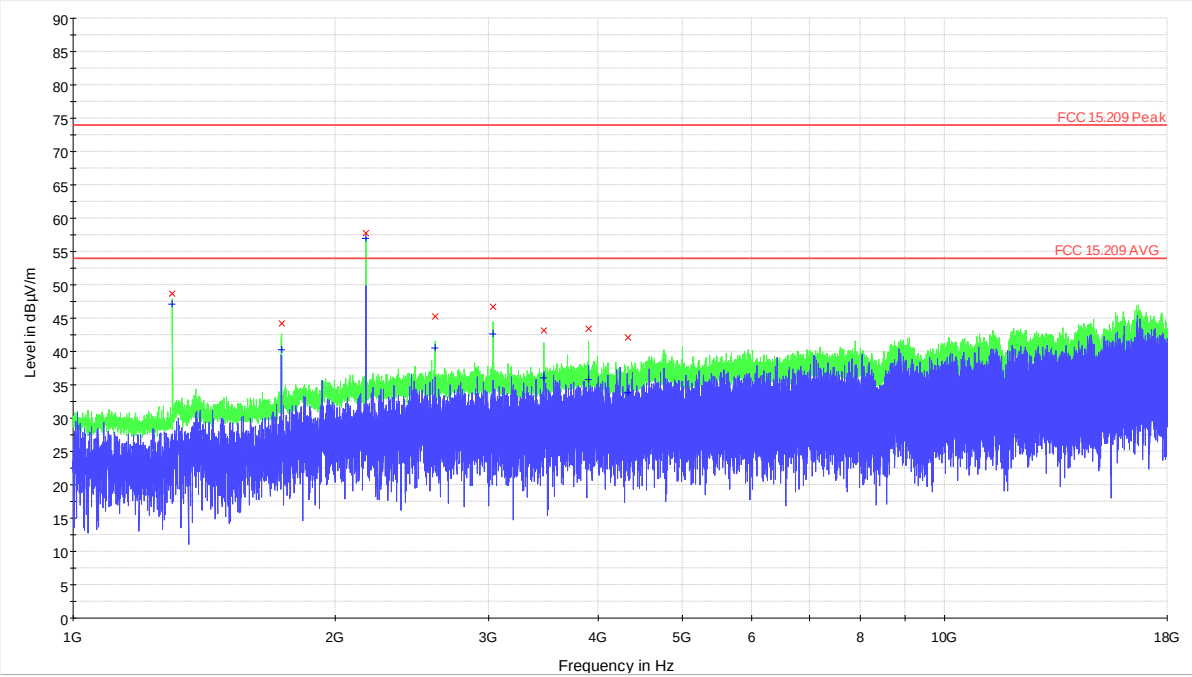
NOTES: Max Power 30 – 1000 MHz

Radiated Emissions
Worst Case: EUT X-axis, Antenna Horz



NOTES: Max Power 1 – 6 GHz

Radiated Emissions
Worst Case: EUT X-axis, Antenna Horz



4.3.6 Final Tabulated Data

Signal	Frequency (MHz)	Peak Measured (dBµV/m)	Duty Cycle Correction (dB)	Result (dBµV/m)	Limit* (dBµV/m)	Margin (dB)
Fundamental	433.366	96.797	-17.21	79.59	80.8	-1.21
2nd Harmonic	866.72	54.3	-17.21	37.1	60.8	-23.7
3rd Harmonic	1300.10	48.7	-17.21	31.5	54.0	-22.5
4th Harmonic	1733.40	47.5	-17.21	30.3	60.8	-30.5
5th Harmonic	2166.80	57.8	-17.21	40.6	60.8	-20.2
6th Harmonic	2600.20	45.3	-17.21	28.1	60.8	-32.7
7th Harmonic	3033.50	46.7	-17.21	29.5	60.8	-31.3
8th Harmonic	3466.90	43.2	-17.21	26.0	60.8	-34.8
9th Harmonic	3900.20	43.4	-17.21	26.2	54.0	-27.8
10th Harmonic	4333.68	42.1	-17.21	24.9	54.0	-29.1

Note: The duty cycle correction factor is based off the worst-case short-term duty cycle of 13.79%

* Emissions falling into restricted bands must comply with the limits of FCC §15.209 / RSS-Gen

4.4 20 dB Bandwidth

This test measures the bandwidth of the fundamental transmission frequency of the device under test. This test utilizes the n-dB down method specified in ANSI C63.10 section 6.9.2

4.4.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	06/30/2020	
Standard	FCC Part 15.231(c); RSS-210 A.1.3						
Product Model	RF3405E			**Serial#**	0001		
Configuration	See test plan for details.						
Test Set-up	Tested at 3m, semi-anechoic chamber, EUT placed on turntable. See test plan for details						
EUT Powered By	3 VDC	**Temp**	22º C	**Humidity**	58%	**Pressure**	1001 mbar
Perf. Criteria	OBW < 1.083 MHz (Within Limit)			**Perf. Verification**	Readings within Limit		
Mod to EUT	None			**Test Performed By**	Alexander Sowinski		

4.4.2 Test Procedure

Occupied Bandwidth measurements were taken at 3 meters in the semi-anechoic chamber. RBW and VBW were adjusted according to the procedures outlined in ANSI C63.10, and a peak/max-hold trace was captured as a result.
Per FCC Part 15.231(c) and RSS-210 A.1.3, the maximum bandwidth allowed is defined as follows: "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."

Given that the measured center frequency of the fundamental transmission is 433.368 MHz, The maximum allowed bandwidth of the EUT is 1.083 MHz

4.4.3 Deviations

There were no deviations from the test methodology listed in the test plan for the 20 dB bandwidth test.

4.4.4 Final Result

The 20 dB bandwidth is measured to be **247.80 kHz**

4.4.5 Final Plot

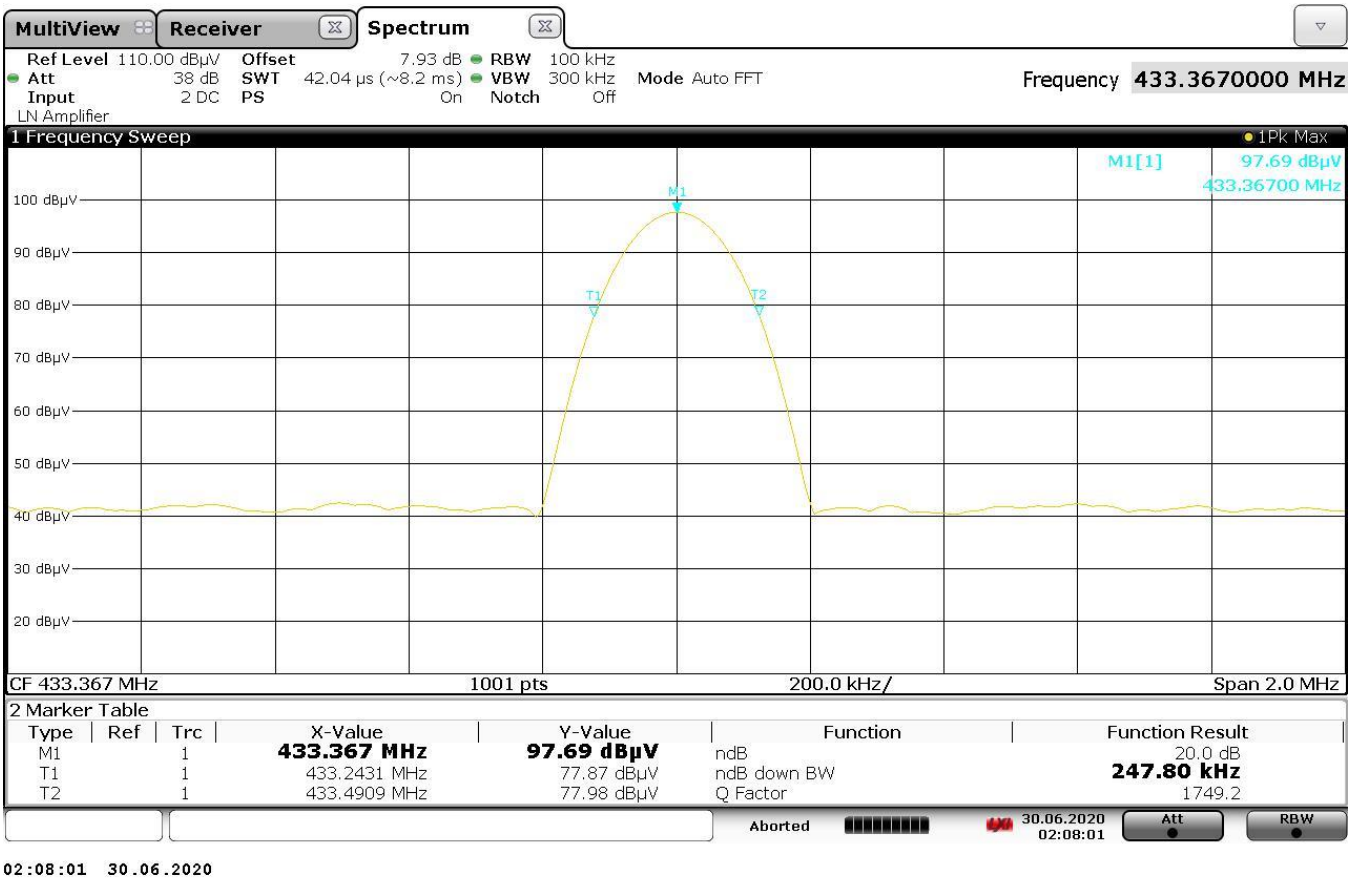


Figure 11 – 20 dB Bandwidth of transmitter

4.5 99% Bandwidth

This test measures the bandwidth of the fundamental transmission frequency of the device under test. This test utilizes the 99% method specified in ANSI C63.10 section 6.9.3.

4.5.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	06/30/2020	
Standard	RSS-Gen 6.7						
Product Model	RF3405E			**Serial#**	0001		
Configuration	See test plan for details.						
Test Set-up	Tested in shielded room, EUT placed on table. See test plan for details						
EUT Powered By	3 VDC	**Temp**	22º C	**Humidity**	58%	**Pressure**	1001 mbar
Perf. Criteria	OBW < 1.083 MHz (Within Limit)			**Perf. Verification**	Readings within Limit		
Mod to EUT	None			**Test Performed By**	Alexander Sowinski		

4.5.2 Test Procedure

Occupied Bandwidth measurements were taken at 3 meters in the semi-anechoic chamber. RBW and VBW were adjusted according to the procedures outlined in ANSI C63.10, and a peak/max-hold trace was captured as a result.
Per FCC Part 15.231(c) and RSS-210 A.1.3, the maximum bandwidth allowed is defined as follows: "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."

Given that the measured center frequency of the fundamental transmission is 433.368 MHz, The maximum allowed bandwidth of the EUT is 1.083 MHz

4.5.3 Deviations

There were no deviations from the test methodology listed in the test plan for the 99% bandwidth test.

4.5.4 Final Result

The 99% bandwidth is measured to be **210.76 kHz**.

4.5.5 Final Plot

Figure 12 – 99% Bandwidth of transmitter

4.6 Frequency Stability

This test is to confirm that the fundamental transmission frequency does not change significantly across different operating voltages and temperatures.

4.6.1 Test Over View

Results	**Complies** (as tested per this report)			**Date**	06/30/2020		
Standard	RSS-Gen 6.11 & 8.11						
Product Model	RF3405E		**Serial#**	0001			
Configuration	See test plan for details.						
Test Set-up	Tested in temperature chamber, EUT placed inside. See test plan for details						
EUT Powered By	2.55, 3.00, 3.45 VDC	**Temp**	-20, 20, 50 º C	**Humidity**	58 %	**Pressure**	1001 mbar
Perf. Criteria	390.078 < F < 467.762 [MHz]		**Perf. Verification**	Readings within Limits			
Mod to EUT	None		**Test Performed By**	Alexander Sowinski			

4.6.2 Test Procedure

Temperature testing was performed inside the temperature chamber. EUT was allowed to soak at each measurement point for 20 minutes before peak/max-hold data was acquired. Voltage testing was performed in the semi-anechoic chamber using a variable DC voltage supply.

Per RSS-Gen 8.11: “If the frequency stability of the license-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation.”

Given that the EUT operates on a single channel within the 433.42 MHz band, the “central 80%” is defined to be 390.078 MHz to 467.762 MHz.

4.6.3 Deviations

There were no deviations from the test methodology listed in the test plan for the frequency stability test.

4.6.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

4.6.5 Final Plots

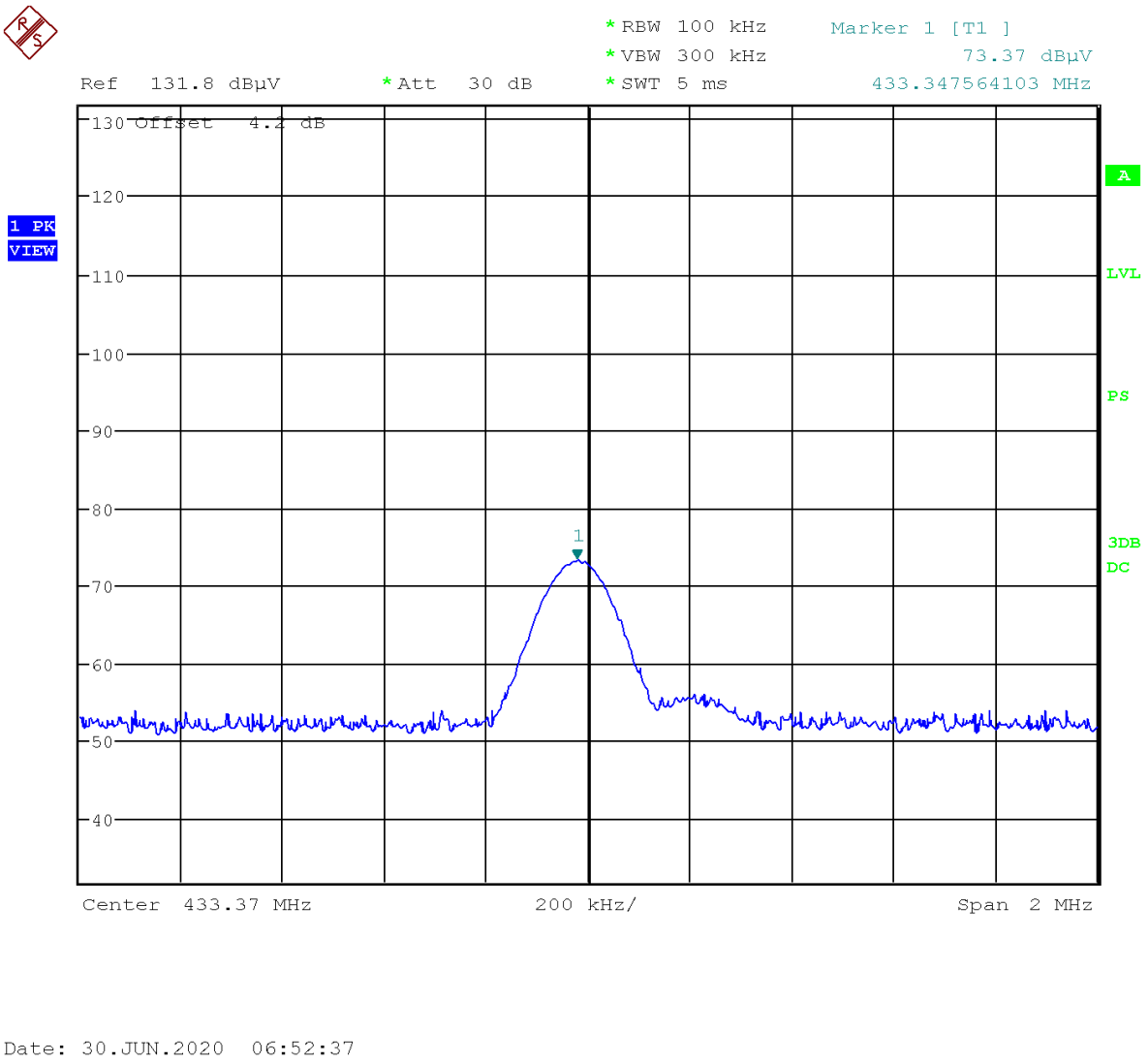


Figure 13 – Sample Stability (-20°C)

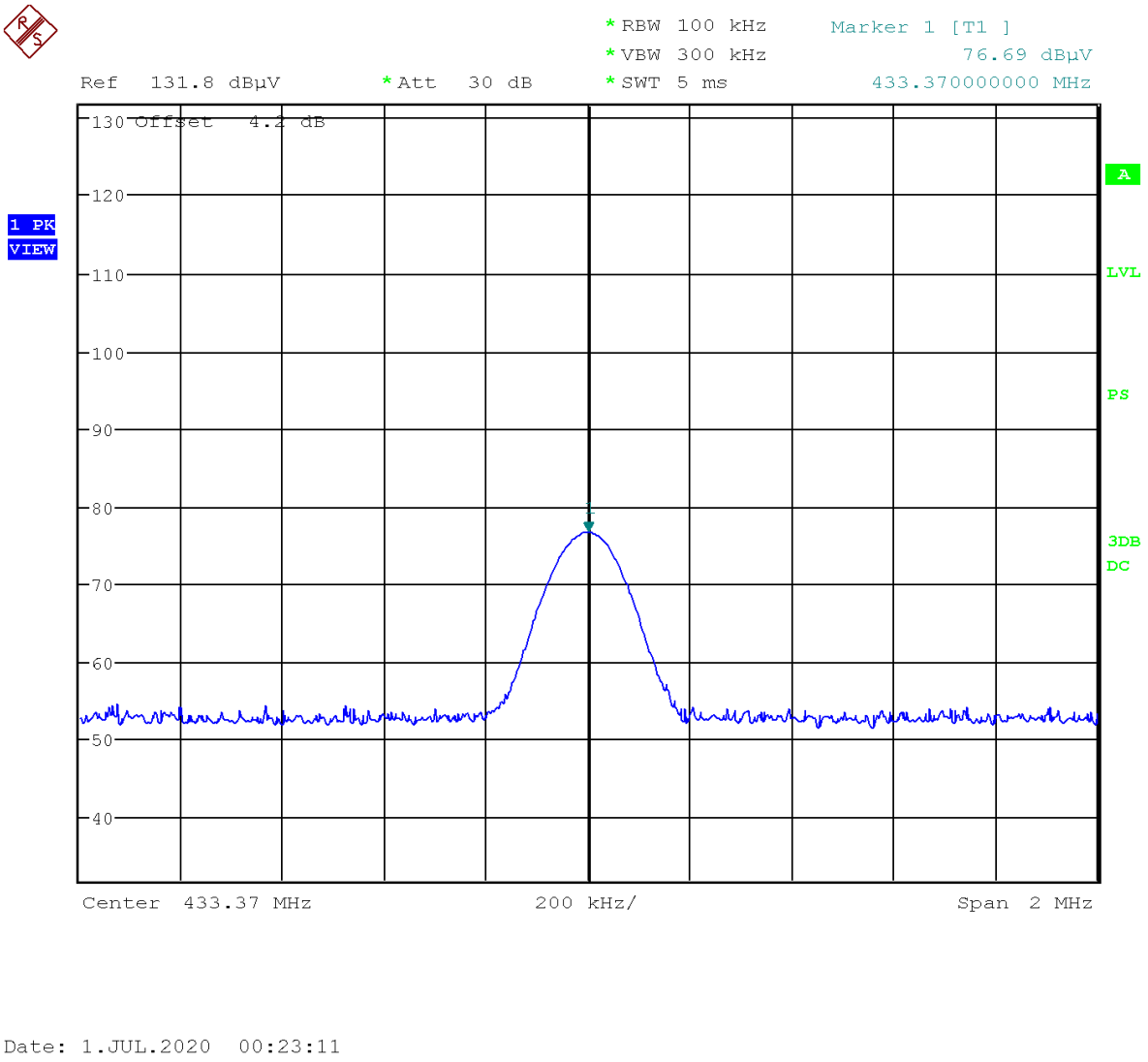


Figure 14 – Sample Stability (2.55 VDC)

4.6.6 Final Data

Table 4: Frequency stability across temperature

Temp:	Freq:	Lower Limit	Upper Limit	Result
°C	MHz	MHz	MHz	
-20	433.347564	390.078	476.762	Pass
20	433.360384	390.078	476.762	Pass
50	433.366794	390.078	476.762	Pass

Table 5: Frequency stability across voltage

Volt:	Freq:	Lower Limit	Upper Limit	Result
VDC	MHz	MHz	MHz	
2.55	433.370000	390.078	476.762	Pass
3.00	433.360384	390.078	476.762	Pass
3.45	433.366794	390.078	476.762	Pass

Appendix A

5 Test Plan

This test report is intended to follow the test plan outlined herein unless otherwise stated. The test plan provides product information, reference standards, and testing details. The product information below came via client, product manual, product itself and or the internet. Test procedure information will reference standards or internal TUV Rheinland NA procedures.

5.1 General Information

Client	Bosch Security Systems, Inc.
Address 1	130 Perinton Pkwy
Address 2	Fairport, NY, 14450
Contact Person	Peter Namisnak
Telephone	585-223-4060
Fax	585-223-9180
e-mail	peter.namisnak@us.bosch.com

5.2 Model(s) Name

RF3405E

5.3 Type of Product

RADION Inertia

5.4 Equipment Under Test (EUT) Description

The RF3405E is a wireless transmitter with an inertia sensor, reed switch, and supervised external contact input. It is used for monitoring doors, windows, or other dry contact devices.

5.5 Wireless

☒	**Yes**	☐	**No**

Antenna Type	Pigtail
Max. Antenna Gain	0 dBi
Modulation Type	OOK
Max. rated E-Field	10,000 µV/m

5.6 General Product Information

Size	**H**	2.7 cm	**W**	2.4 cm	**L**	16.9 cm
Weight	-- kg		**Fork-Lift Needed**	No		
Notes	(1.1 in. x 0.9 in. x 6.7 in.)					

5.7 Modifications

None.

5.8 EUT Electrical Power Information

5.8.1 Electrical Power Type

☐	**AC**	☒	**DC**	☒	**Batteries**	☐	**Host -**

5.8.2 Electrical Power Information

Name	**Type**	**Voltage**		**Frequency**	**Current**	**Notes**
		min	**max**			
3 VDC Lithium Battery	See Below	N/A	3.0	DC	N/A	See Below

Notes	The following battery types are recommended for correct operation of your transmitter: Duracell® DL123A, Energizer® EL123AP, Panasonic®® CR123A

5.9 EUT Modes of Operation during Testing

Full Transmit once 3VDC battery is installed.

5.10 EUT Clock/Oscillator Frequencies

Please specify the maximum clock frequency used in the product – _____433.42 MHz_____

In the table below, please specify other clock frequencies and sensitive operating frequencies in the product.

Clock Frequencies & Sensitive Frequencies
13.54 MHz
433.42 MHz

5.11 Electrical Support Equipment

Type	Manufacturer	Model	Connected To
None			

5.12 Non - Electrical Support Equipment

Item	Notes
Gas	None
Water	None
Air	None

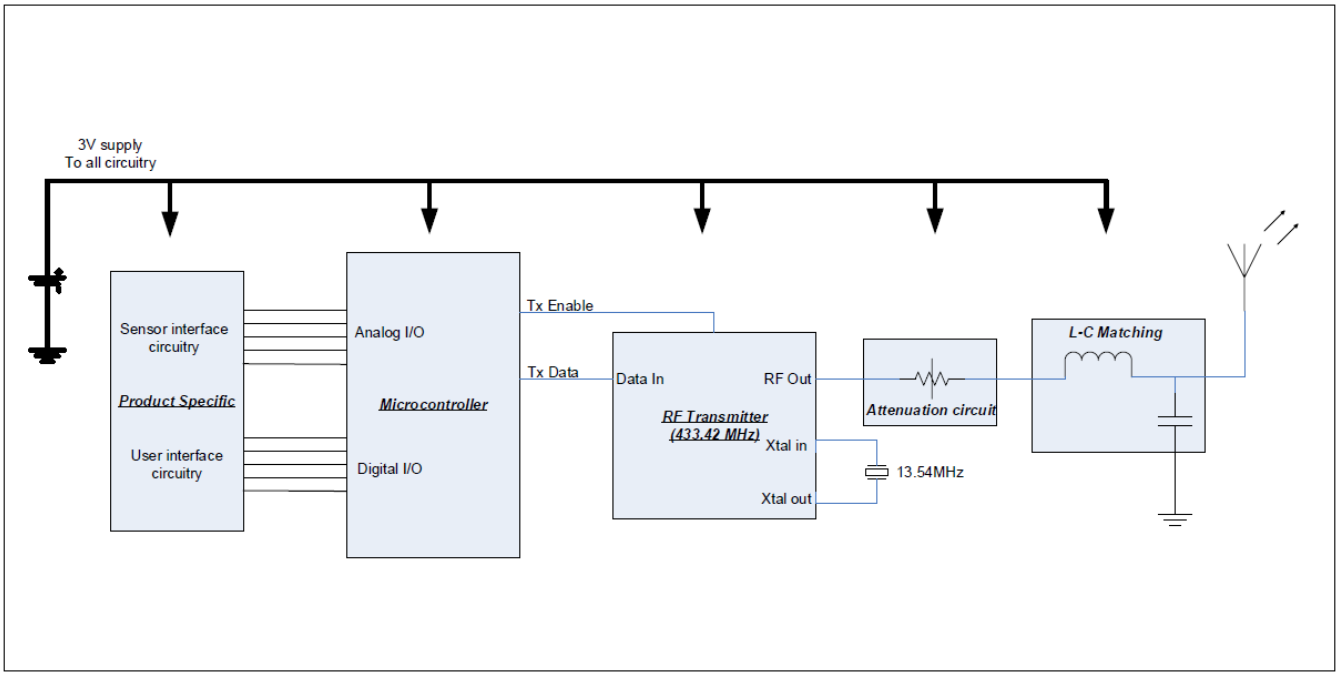
5.13 EUT Equipment/Cabling Information

EUT Port	Connected To	Location	Cable Type		
			Length	Shielded	Bead
None					

5.14 EUT Configuration

Configuration	Description
1	EUT powered by 3VDC battery
Notes	All configurations are the same except as noted above

5.15 Block Diagram



END OF REPORT