APPLICATION CERTIFICATION
On Behalf of
HMC Holdings, LLC

Square Top Digital Deadbolt with remote
Model No.: SN12010200

FCC ID: 2AP9FSRR402

Prepared for	:	HMC Holdings, LLC
Address	:	1605 OLD Route, 18 STE 4-36, Wampum, PA-16157 United States
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
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Report Number	:	ATE20181656
Date of Test	:	Sep. 14-Sep. 18, 2018
Date of Report	:	Sep. 19, 2018

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Test Report Certification

Applicant	:	HMC Holdings, LLC
Manufacturer	:	HMC Holdings, LLC
EUT Description	:	Square Top Digital Deadbolt with remote
Model No.	:	SN12010200

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.231a
ANSI C63.10: 2013

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.231a. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test :	Sep. 14-Sep. 18, 2018
Date of Report :	Sep. 19, 2018

Prepared by : _____
(Steven Yang, Engineer)

Approved & Authorized Signer : _____
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

EUT	:	Square Top Digital Deadbolt with remote
Model Number	:	SN12010200, RB12020201, SN12020201, PB12020201, RB12020101, SN12020101, PB12020101, RB12010201, SN12010201, PB12010201, RB12010101, SN12010101, PB12010101, RB11020201, SN11020201, PB11020201, RB11020101, SN11020101, PB11020101, RB11010201, SN11010201, PB11010201, RB11010101, SN11010101, PB11010101 (Note: We hereby state that these models are identical in interior structure, electrical circuits and components, only different in model name, Therefore, only model SN12010200 is for tests.)
Power Supply	:	DC 12V (1*Alkaline Battery)
Modulation Mode	:	ASK
Operation Frequency	:	433.92MHz
Antenna type	:	PCB antenna
Antenna gain	:	-2dBi
RF power setting in test	:	Max power
Applicant	:	HMC Holdings, LLC
Address	:	1605 OLD Route, 18 STE 4-36, Wampum, PA-16157 United States
Manufacturer	:	HMC Holdings, LLC
Address	:	1605 OLD Route, 18 STE 4-36, Wampum, PA-16157 United States
Date of sample received	:	Sep. 7, 2018
Date of Test	:	Sep. 14-Sep. 18, 2018

1.2.Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358 Listed by Innovation, Science and Economic Development Canada (ISEDC) The Registration Number is 5077A-2 Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193 Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.3.Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 06, 2018	One Year
EMI Test Receiver	Rohde&Schwarz	ESR	101817	Jan. 06, 2018	One Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 06, 2018	One Year
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 06, 2018	One Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 06, 2018	One Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 06, 2018	One Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 06, 2018	One Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 06, 2018	One Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 06, 2018	One Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 06, 2018	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 06, 2018	One Year
Radiated Emission Measurement Software: EZ_EMC V1.1.4.2					

3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	N/A
Section 15.231(b)	Radiated Emission	Compliant
Section 15.231(c)	20dB Bandwidth	Compliant
Section 15.231(a)(1)	Release Time Measurement	Compliant
Section 15.203	Antenna Requirement	Compliant

The product is a manually operated transmitter.
Section 15.231 (a) (2), (3), (4) and (5) are not applicable.

Note: The power supply mode of the EUT is DC 12V, According to the FCC standard requirements, conducted emission is not applicable.

4. THE FIELD STRENGTH OF RADIATION EMISSION

4.1.Block Diagram of Test Setup

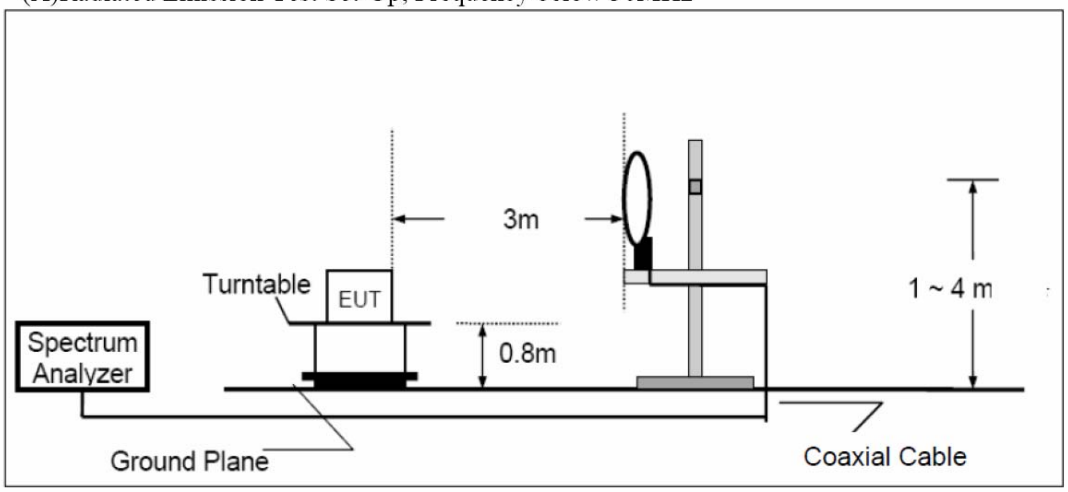
4.1.1.Block diagram of connection between the EUT and simulators

EUT

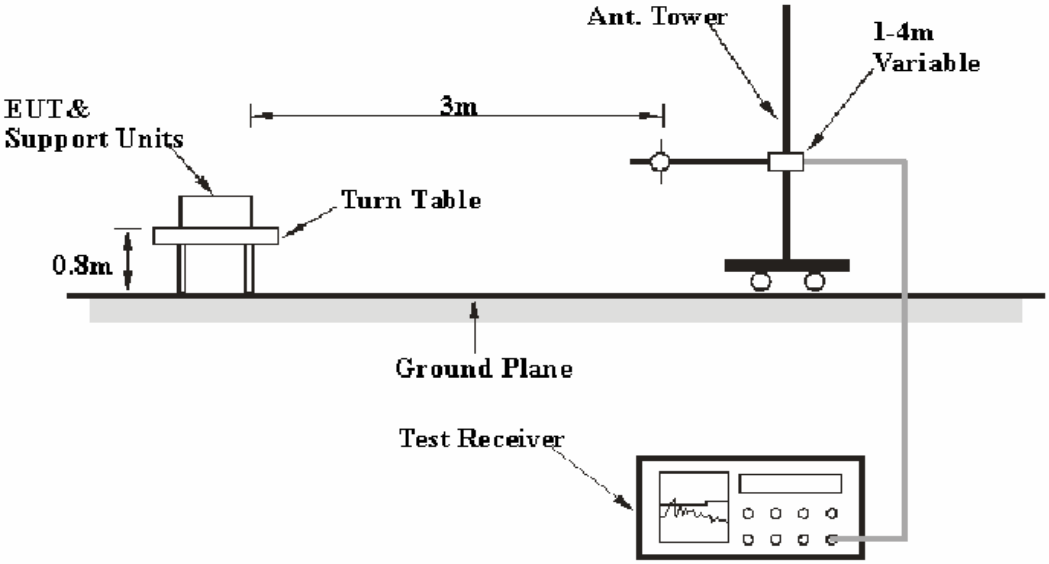
(EUT: Square Top Digital Deadbolt with remote)

4.1.2.Semi-Anechoic Chamber Test Setup Diagram

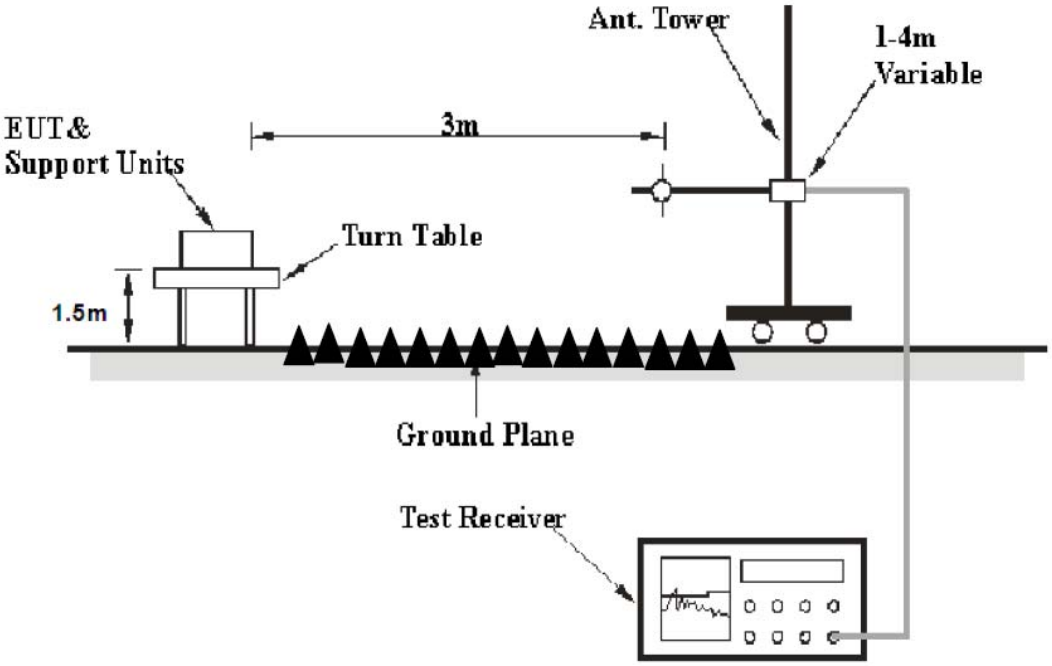
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30-1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



4.2. The Field Strength of Radiation Emission Measurement Limits

4.2.1. Radiation Emission Measurement Limits According to FCC Part 15 Section 15.231(b)

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750	125-375
174-260	3750	375
260-470	3750-12500	375-1250
Above 470	12500	1250

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.82(F) - 6136; for the band 260-470 MHz, uV/m at 3 meters = 41.67(F) - 7083. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

4.2.2. Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section15.209.

4.3.Configuration of EUT on Measurement

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4. Operating Condition of EUT

4.4.1.Setup the EUT and simulator as shown as Section 4.1.

4.4.2.Turn on the power of all equipment.

4.4.3. Let the EUT work in TX mode measure it.

4.5.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 120 kHz in 30-1000 MHz, and 1 MHz in 1000 MHz.

4.6.Data Sample

Frequency (MHz)	Reading (dBμv)	Factor (dB/m)	Result (dBμv/m)	Limit (dBμv/m)	Margin (dB)	Remark
X.XX	48.69	-13.35	35.34	46	-10.66	QP

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

4.7.The Field Strength of Radiation Emission Measurement Results

PASS.

Note: The radiation emissions from 9KHz-30MHz are not reported, because the test values lower than the limits of 20dB.

The frequency range from 30 MHz to 5000 MHz is checked.

EUT :	Square Top Digital Deadbolt with remote		
Model No. :	SN12010200	Power Supply :	DC 12V
Test Mode :	TX	Test Engineer :	Star

Frequency (MHz)	Reading (dBμV/m)	Factor Corr.	Average Factor	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
433.92	**90.51**	**-13.51**	**-5.61**	**71.39**	**77.00**	**80.83**	**100.83**	**-9.44**	**-23.83**	Horizontal
867.8406	59.45	-5.01	-5.61	48.83	54.44	60.83	80.83	-12.00	-26.39	
1301.761	58.93	-11.91	-5.61	41.41	47.02	60.83	80.83	-19.42	-33.81	
1735.685	53.77	-10.31	-5.61	37.85	43.46	60.83	80.83	-22.98	-37.37	
433.92	**88.91**	**-13.51**	**-5.61**	**69.79**	**75.40**	**80.83**	**100.83**	**-11.04**	**-25.43**	Vertical
867.8406	56.75	-5.01	-5.61	46.13	51.74	60.83	80.83	-14.70	-29.09	
1301.764	57.66	-11.91	-5.61	40.14	45.75	60.83	80.83	-20.69	-35.08	
1735.682	53.58	-10.31	-5.61	37.66	43.27	60.83	80.83	-23.17	-37.56	

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

3. FCC Limit for Average Measurement = 41.67(433.92)-7083 = 10998.4464 μV/m =80.83 dBμV/m

4. The spectral diagrams in appendix I display the measurement of peak values.

5. Average value= PK value + Average Factor (duty factor)

6. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

7. The EUT is tested radiation emission in three axes(X,Y,Z). The worst emissions are reported in three axes.

8. Pulse Desensitization Correction Factor

Pulse Width (PW) = 0.72ms

2/PW = 2/0.72ms = 2.778kHz

RBW (100 kHz) > 2/PW (2.778 kHz)

Therefore PDCF is not needed.

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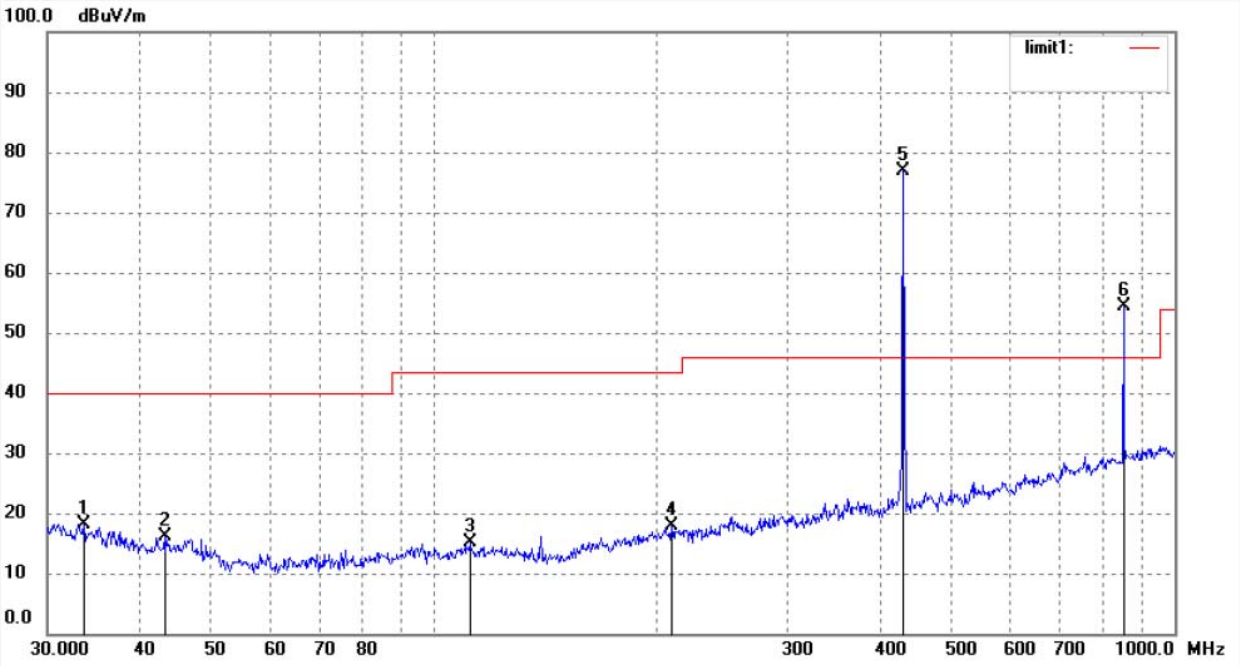
Job No.: STAR2018 #457	Polarization: Horizontal
Standard: FCC PART 15C 3M Radiated	Power Source: DC 12V
Test item: Radiation Test	Date: 2018/09/18
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:29:47
EUT: SquareTop Digital Deadbolt with remote	Engineer Signature: star
Mode: TX	Distance:
Model: SN12010200	
Manufacturer: HMC Holdings, LLC	

Note: Report No.:ATE20181656



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.6880	35.53	-17.32	18.21	40.00	-21.79	peak	200	142	
2	43.2331	35.32	-19.29	16.03	40.00	-23.97	peak	200	100	
3	111.6397	36.24	-21.11	15.13	43.50	-28.37	peak	200	268	
4	209.3924	36.31	-18.49	17.82	43.50	-25.68	peak	200	302	
5	433.9201	90.51	-13.51	77.00			peak	200	145	
6	867.8406	59.45	-5.01	54.44			peak	200	80	

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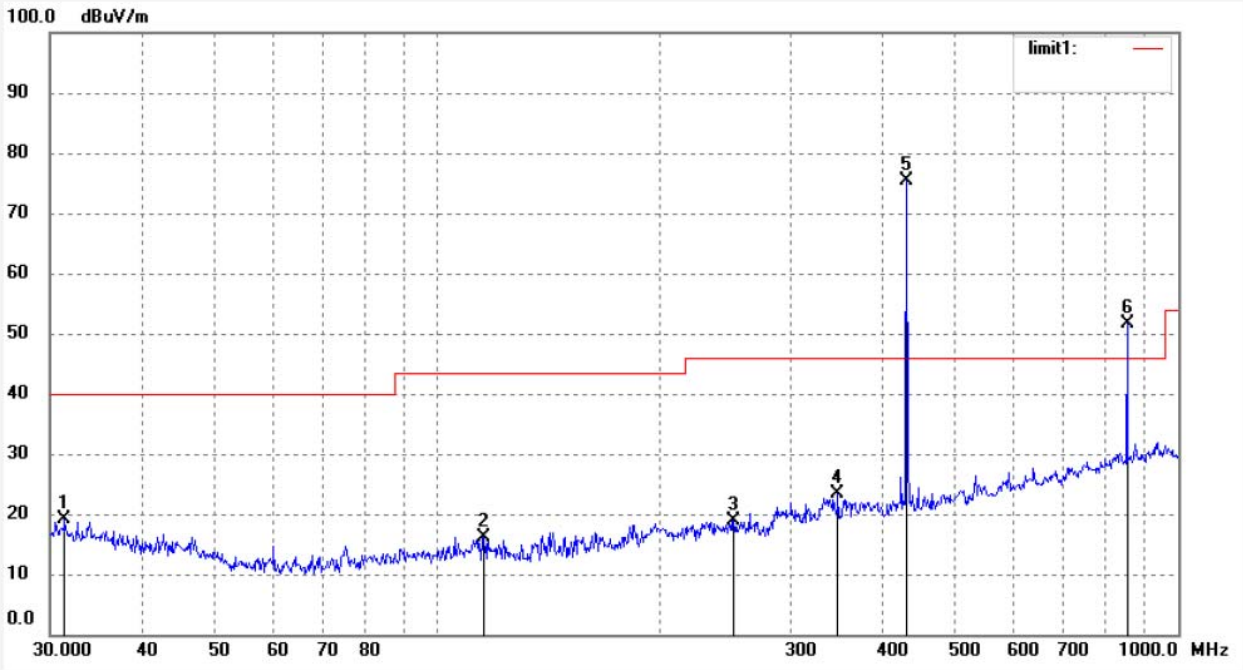
Job No.: STAR2018 #458	Polarization: Vertical
Standard: FCC PART 15C 3M Radiated	Power Source: DC 12V
Test item: Radiation Test	Date: 2018/09/18
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:32:01
EUT: SquareTop Digital Deadbolt with remote	Engineer Signature: star
Mode: TX	Distance:
Model: SN12010200	
Manufacturer: HMC Holdings, LLC	

Note: Report No.:ATE20181656



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	31.4021	36.06	-16.99	19.07	40.00	-20.93	peak	100	53	
2	115.6320	37.45	-21.21	16.24	43.50	-27.26	peak	100	145	
3	251.3676	37.04	-18.10	18.94	46.00	-27.06	peak	100	271	
4	347.2921	37.99	-14.72	23.27	46.00	-22.73	peak	100	203	
5	433.9202	88.91	-13.51	75.40			peak	100	255	
6	867.8406	56.75	-5.01	51.74			peak	100	174	

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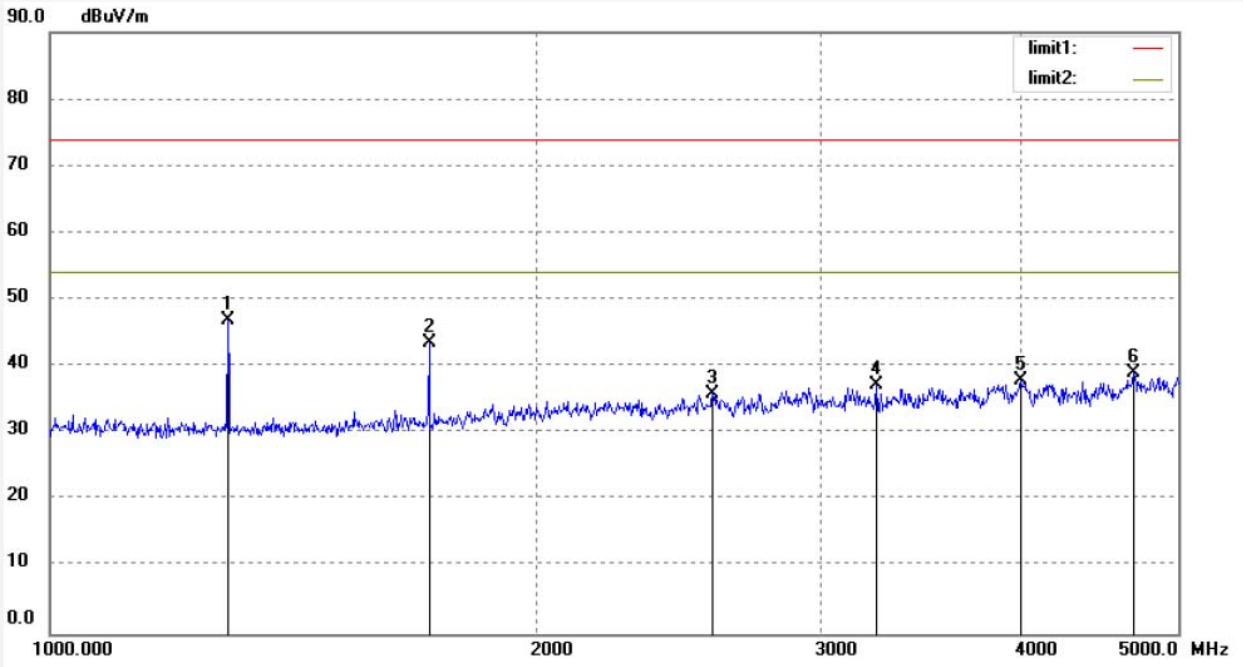
Job No.: STAR2018 #460	Polarization: Horizontal
Standard: FCC PART 15C 3M Radiated	Power Source: DC 12V
Test item: Radiation Test	Date: 2018/09/18
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:35:57
EUT: SquareTop Digital Deadbolt with remote	Engineer Signature: star
Mode: TX	Distance:
Model: SN12010200	
Manufacturer: HMC Holdings, LLC	

Note: Report No.:ATE20181656



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1301.761	58.93	-11.91	47.02			peak	200	112	
2	1735.685	53.77	-10.31	43.46			peak	200	145	
3	2574.320	43.49	-7.49	36.00	74.00	-38.00	peak	200	203	
4	3250.287	42.63	-5.35	37.28	74.00	-36.72	peak	200	258	
5	3992.333	41.29	-3.32	37.97	74.00	-36.03	peak	200	200	
6	4694.028	41.61	-2.66	38.95	74.00	-35.05	peak	200	246	

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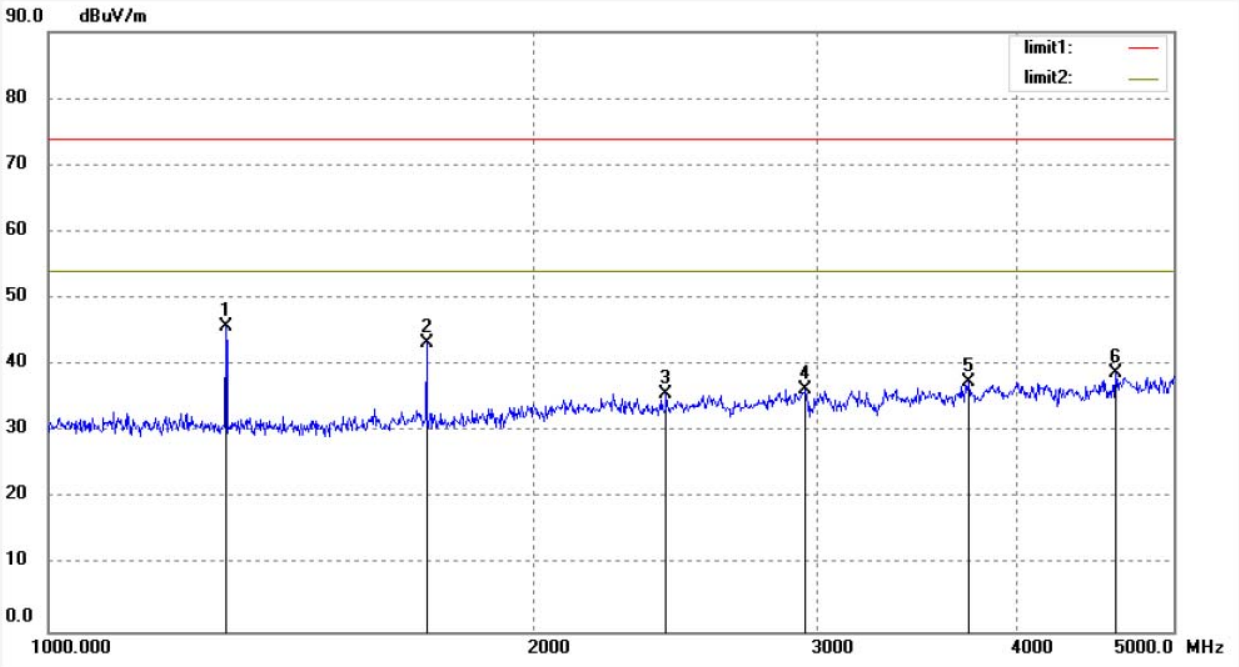
Job No.: STAR2018 #459	Polarization: Vertical
Standard: FCC PART 15C 3M Radiated	Power Source: DC 12V
Test item: Radiation Test	Date: 2018/09/18
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:34:40
EUT: SquareTop Digital Deadbolt with remote	Engineer Signature: star
Mode: TX	Distance:
Model: SN12010200	
Manufacturer: HMC Holdings, LLC	

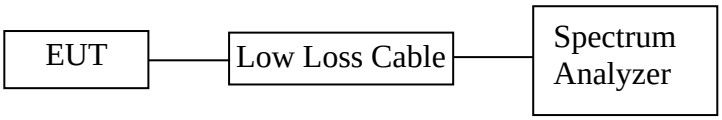
Note: Report No.:ATE20181656



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1301.764	57.66	-11.91	45.75			peak	150	350	
2	1735.682	53.58	-10.31	43.27			peak	150	245	
3	2420.702	43.64	-7.92	35.72	74.00	-38.28	peak	150	103	
4	2954.157	42.66	-6.35	36.31	74.00	-37.69	peak	150	99	
5	3729.862	41.32	-3.95	37.37	74.00	-36.63	peak	150	125	
6	4603.703	41.80	-2.96	38.84	74.00	-35.16	peak	150	310	

5. 20DB OCCUPIED BANDWIDTH

5.1.Block Diagram of Test Setup



5.2.The Bandwidth of Emission Limit According To FCC Part 15 Section 15.231(c)

The bandwidth of emission shall be no wider than 0.25% of the center frequency. Therefore, the bandwidth of the emission limit is 433.92 MHz×0.25% = 1.0848 MHz. Bandwidth is determined at the two points 20 dB down from the top of modulated carrier.

5.3.EUT Configuration on Measurement

The equipment are installed on the bandwidth of emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4.Operating Condition of EUT

5.4.1.Setup the EUT and simulator as shown as Section 5.1.

5.4.2.Turn on the power of all equipment.

5.4.3.Let the EUT work in TX mode measure it.

5.5.Test Procedure

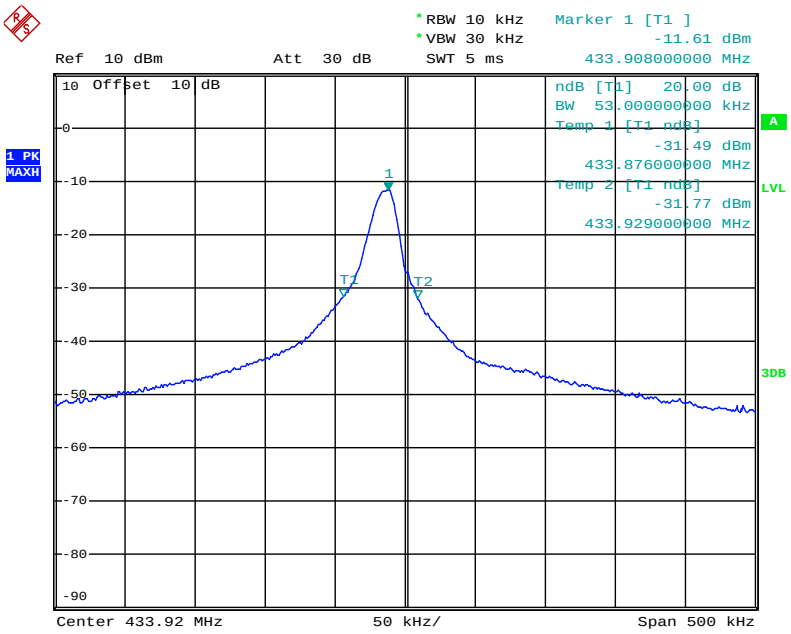
5.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 10 kHz, VBW = 30 kHz, Span = 500KHz.

5.5.2.Set SPA Max hold, Mark peak, -20 dB.

5.6.Measurement Result

Frequency (MHz)	-20 dB bandwidth (MHz)	Limit (MHz)	Result
433.92	0.053	≤1.0848	Pass

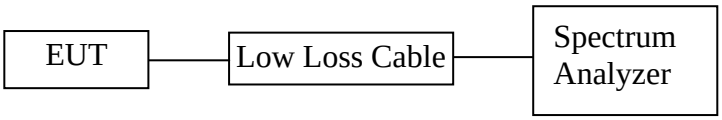
The spectral following:



Date: 14.SEP.2018 11:58:10

6. RELEASE TIME MEASUREMENT

6.1.Block Diagram of Test Setup



6.2.Release Time Measurement According To FCC Part 15 Section 15.231(a)

Section 15.231(a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.3.EUT Configuration on Measurement

The equipment are installed on Release Time Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX mode measure it.

6.5.Test Procedure

6.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz. Sweep time = 5 s.

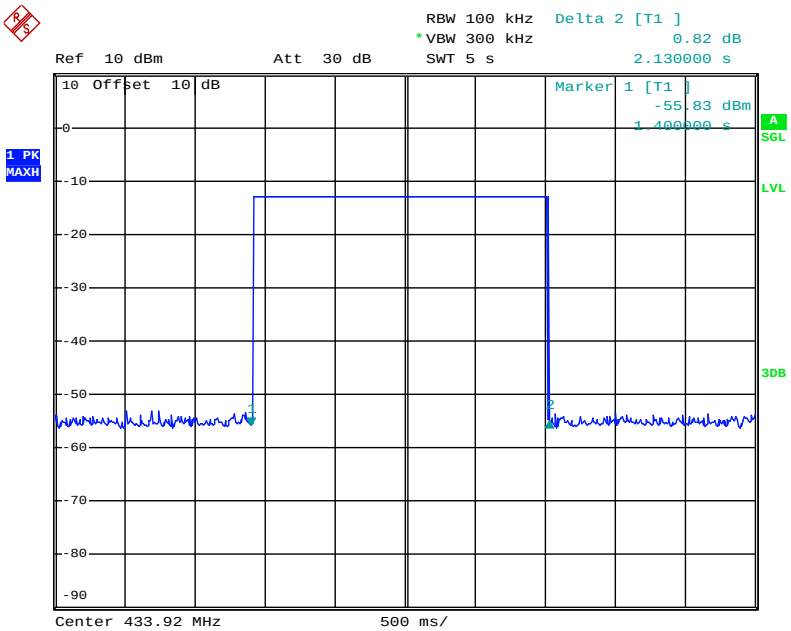
6.5.2.Set EUT as normal operation and press Transmitter button.

6.5.3.Set SPA View. Delta Mark time.

6.6.Measurement Result

Frequency (MHz)	Release Time (seconds)	Limit (seconds)	Result
433.92	2.13	< 5	Pass

The spectral following:



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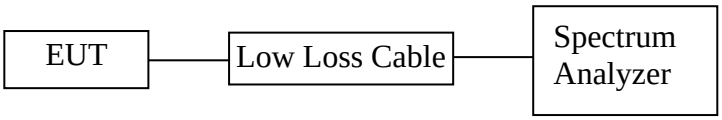
7. AVERAGE FACTOR MEASUREMENT

7.1.Block Diagram of Test Setup



7.2.Average factor Measurement according to ANSI C63.10: 2013

ANSI C63.10-2013 Section 7.5 Unless otherwise specified, 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 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval.64 The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation (10):
Average factor in dB = 20 log (duty cycle)

7.3.EUT Configuration on Measurement

The equipment are installed on average factor Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

7.4.1.Setup the EUT and simulator as shown as Section 7.1.

7.4.2.Turn on the power of all equipment.

7.4.3.Let the EUT work in TX mode measure it.

7.5.Test Procedure

7.5.1.The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation.

7.5.2.Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.

7.5.3.Set EUT as normal operation.

7.5.4.Set SPA View. Delta Mark time.

7.6. Measurement Result

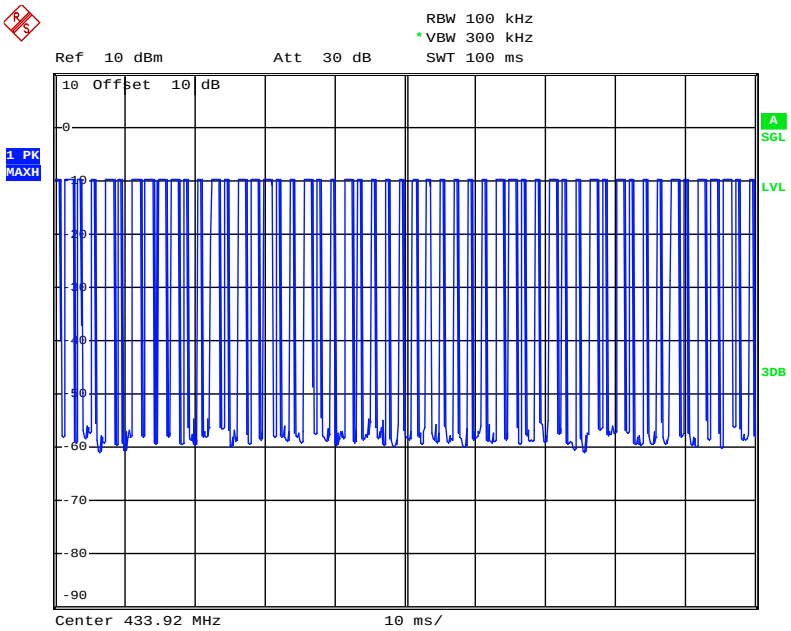
The duty cycle is simply the on time divided by the period:

Effective period of the cycle = (1.4×21) + (0.72×32)ms =52.44 ms

DC =52.44ms/100ms=0.524

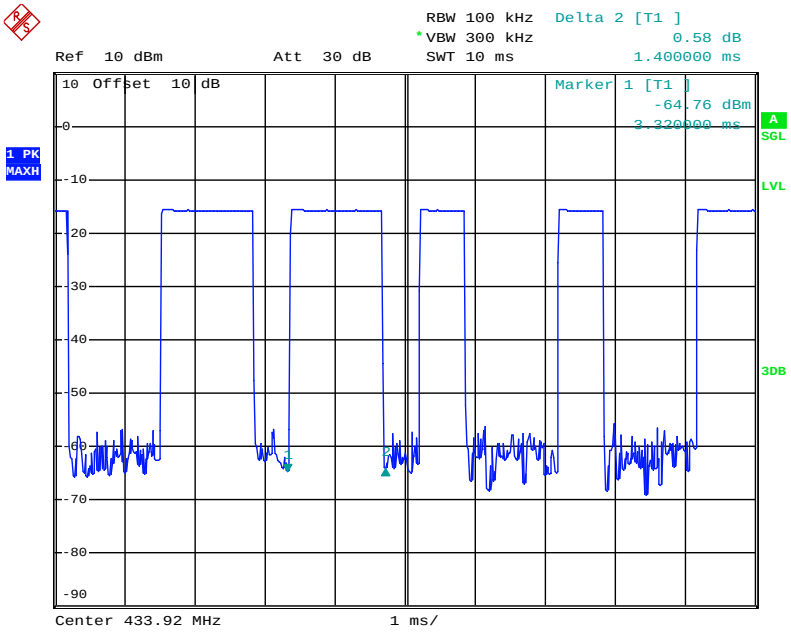
Therefore, the average factor is found by 20log0.524= -5.61dB

The spectral following:



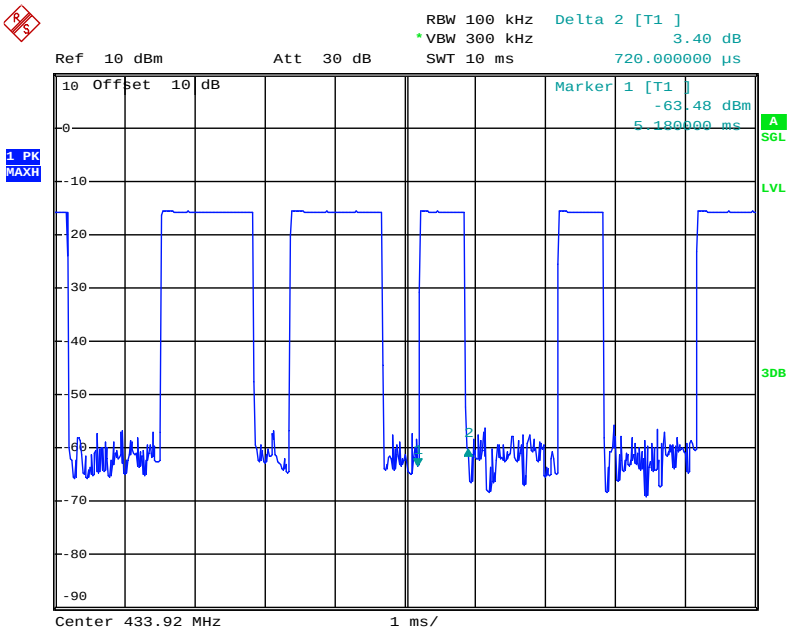
Date: 14.SEP.2018 12:08:42

The graph shows the duration of ‘on’ signal. From marker 1 to marker 2, Duration is 1.4ms.



Date: 14.SEP.2018 12:13:14

The graph shows the duration of ‘on’ signal. From marker 1 to marker 2, Duration is 0.72ms.



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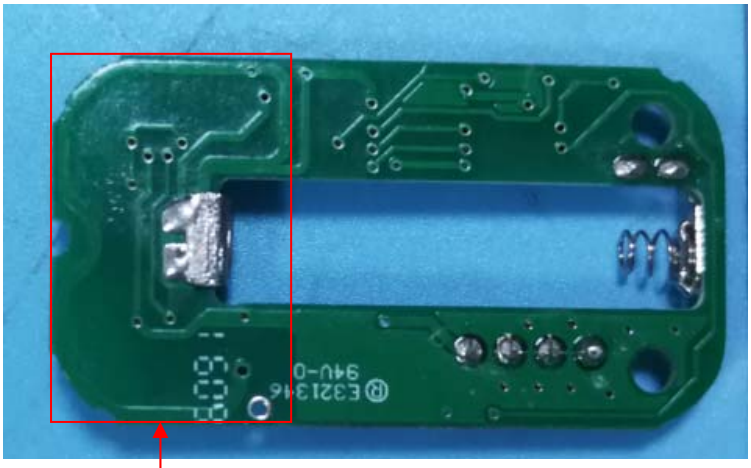
8. ANTENNA REQUIREMENT

8.1.The Requirement

According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

8.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is -2dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna

******* End of Test Report *******