



# FCC PART 15.231

# **TEST REPORT**

For

# Hangzhou Meari Technology Co., Ltd.

No.91, Chutian Road, Xixing Block, Binjiang, Hangzhou, China 310051

# FCC ID: 2AG7CBELL1C

Report Type: Original Report		Product Type: Wireless DoorBell	
Test Engineer:	Hope Zhang	Hope Zhang	1
Report Number:	RSHA18091000	2-00A	
Report Date:	2018-12-21		
Reviewed By:	Oscar Ye RF Leader	Oscar. Ye	1
Prepared By:		38934268	

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### **GENERAL INFORMATION**

### **Product Description for Equipment under Test (EUT)**

Applicant	Hangzhou Meari Technology Co., Ltd.	
Tested Model	Bell 1C	
Series Model	EOD1-1001-SIL, PBH605	
Product Type	Wireless DoorBell	
Dimension	58 mm(L)* 130 mm(W)* 26 mm(H)	
Power Supply	DC 5.0V from adapter, DC3.6V from battery	

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Adapter Information: Model: TPA-46B050100UU Input: AC100-240V, 50/60Hz, 0.2A

Output: DC5V, 1000mA

Note: The difference between the tested model and series models was explained in the declaration letter.

### **Objective**

This test report is prepared on behalf of *Hangzhou Meari Technology Co., Ltd.* All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209, 15.35(c) and 15.231 rules.

### Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submittal with FCC ID: 2AG7CBELL1C.

#### **Test Methodology**

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

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<sup>\*</sup>All measurement and test data in this report was gathered from production sample serial number: 20180910002. (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2018-09-10.

### **Measurement Uncertainty**

Item		Uncertainty	
AC Power Lines Conducted Emissions		3.19 dB	
RF conducte	ed test with spectrum	0.9dB	
	30MHz~1GHz	6.11dB	
Radiated emission	1GHz~6GHz	4.45dB	
	6GHz ~18GHz	5.23dB	
Occup	ied Bandwidth	0.5kHz	
Temperature		1.0℃	
Humidity		6%	

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## **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

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# **SYSTEM TEST CONFIGURATION**

### Justification

Channel List:

Channel	Frequency (MHz)			
1	433.92			

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### **EUT Exercise Software**

No software was used during the test. The EUT can transmit continuously through long pressing the buttons in engineering mode.

## **Equipment Modifications**

No modification was made to the EUT.

## **Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number	
/	/	/	/	

### **External I/O Cable**

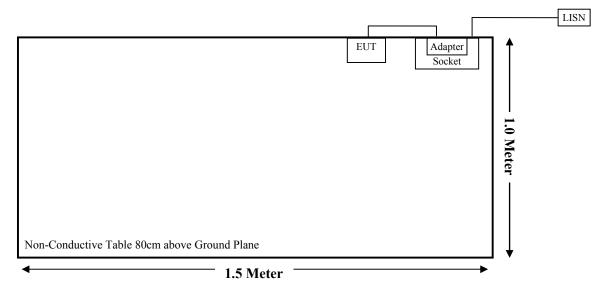
Cable Description	Length (m)	From Port	То	
Power Cable	Power Cable 1.0		Adapter	

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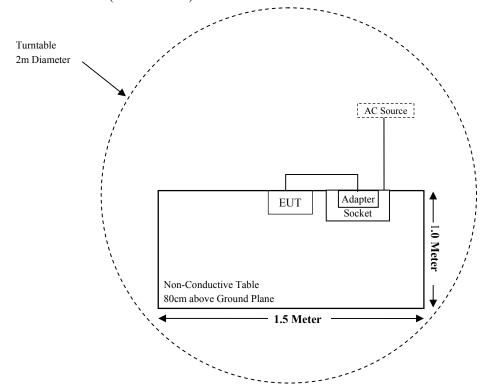
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# **Block Diagram of Test Setup**

For Conducted Emissions:

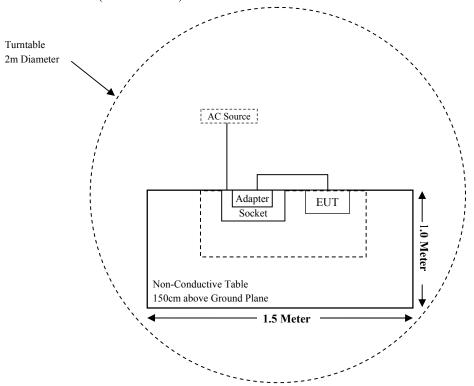


For Radiated Emissions(Below 1GHz):



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# For Radiated Emissions(Above 1GHz):



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# **SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result	
§15.203	Antenna Requirement	Compliance	
§15.207(a)	Conducted Emissions	Compliance	
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliance	
§15.231 (a) (2)	Deactivation	Compliance	
§15.231 (c)	20dB Emission Bandwidth	Compliance	

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# **TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Model Serial Number		Calibration Due Date		
Radiated Emission Test(Chamber 1#)							
Rohde & Schwarz	hwarz EMI Test Receiver ESCI 100195 2017-1		2017-11-12	2018-11-11			
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-12	2019-11-11		
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25		
Sonoma Instrunent	Pre-amplifier	310N	171205	2018-08-15	2019-08-14		
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/		
MICRO-COAX	Coaxial Cable	Cable-8	008	2018-08-15	2019-08-14		
MICRO-COAX	Coaxial Cable	Cable-9	009	2018-08-15	2019-08-14		
MICRO-COAX	Coaxial Cable	Cable-10	010	2018-08-15	2019-08-14		
	Radiated E	mission Test(Char	nber 2#)				
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-27	2019-08-26		
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2018-07-23	2019-07-22		
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10		
A.H.Systems, inc	Amplifier	2641-1	466	2018-09-11	2019-09-10		
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/		
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14		
MICRO-COAX	Coaxial Cable	Cable-11	011	2018-08-15	2019-08-14		
MICRO-COAX	Coaxial Cable	Cable-12	012	2018-08-15	2019-08-14		
MICRO-COAX	Coaxial Cable	Cable-13	013	2018-08-15	2019-08-14		
	Cond	lucted Emission To	est				
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2017-11-12	2018-11-11		
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2017-11-12	2018-11-11		
BACL	Auto test Software	BACL-EMC	CE001	/	/		
Narda	Attenuator/6dB	10690812-2	26850-6	2018-01-10	2019-01-09		
MICRO-COAX	Coaxial Cable	Cable-15	015	2018-08-15	2019-08-14		

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<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# FCC§15.203 - ANTENNA REQUIREMENT

## **Applicable Standard**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

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### **Antenna Connected Construction**

The EUT has an internal integrated antenna which was permanently attached and the antenna gain is 2.15dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

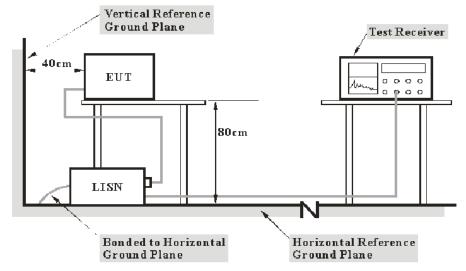
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# FCC §15.207 (a) - AC LINE CONDUCTED EMISSIONS

### **Applicable Standard**

FCC §15.207(a)

### **EUT Setup**



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Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

## **EMI Test Receiver Setup**

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

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#### **Test Procedure**

ANSI C63.10-2013 clause 6.2

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

### **Corrected Factor & Margin Calculation**

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

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The "Margin" column of the following data tables indicates the degree of Compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin (dB) = Limit (dB $\mu$ V) – Corrected Amplitude (dB $\mu$ V)

### **Test Results Summary**

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

#### **Test Data**

#### **Environmental Conditions**

Temperature:	20.2 ℃		
<b>Relative Humidity:</b>	51 %		
ATM Pressure:	101.3 kPa		

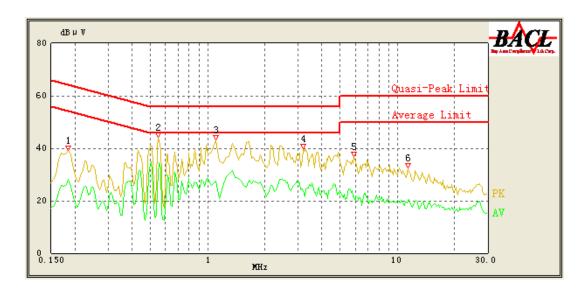
The testing was performed by Hope Zhang on 2018-10-29.

Test Result: Compliant.

EUT operation mode: Transmitting

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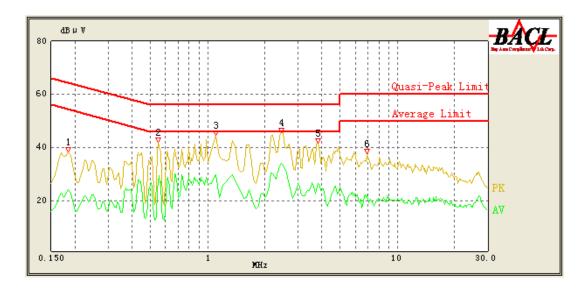
# AC 120V/60 Hz, Line



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Frequency (MHz)	Corrected Amplitude (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.185	39.22	QP	9.000	L1	16.02	65.00	25.78	Compliance
0.185	28.13	AV	9.000	L1	16.02	55.00	26.87	Compliance
0.550	44.32	QP	9.000	L1	16.05	56.00	11.68	Compliance
0.555	34.56	AV	9.000	L1	16.04	46.00	11.44	Compliance
1.100	43.31	QP	9.000	L1	15.88	56.00	12.69	Compliance
1.100	27.62	AV	9.000	L1	15.88	46.00	18.38	Compliance
3.200	39.75	QP	9.000	L1	15.85	56.00	16.25	Compliance
3.200	23.78	AV	9.000	L1	15.85	46.00	22.22	Compliance
5.900	36.92	QP	9.000	L1	15.91	60.00	23.08	Compliance
5.900	21.58	AV	9.000	L1	15.91	50.00	28.42	Compliance
11.350	32.36	QP	9.000	L1	16.10	60.00	27.64	Compliance
11.400	19.80	AV	9.000	L1	16.10	50.00	30.20	Compliance

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Frequency (MHz)	Corrected Amplitude (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Comment
0.185	38.41	QP	9.000	N	16.05	65.00	26.59	Compliance
0.185	24.35	AV	9.000	N	16.05	55.00	30.65	Compliance
0.550	42.14	QP	9.000	N	16.08	56.00	13.86	Compliance
0.555	29.38	AV	9.000	N	16.08	46.00	16.62	Compliance
1.100	44.69	QP	9.000	N	15.94	56.00	11.31	Compliance
1.100	29.83	AV	9.000	N	15.94	46.00	16.17	Compliance
2.450	45.69	QP	9.000	N	15.90	56.00	10.31	Compliance
2.450	33.93	AV	9.000	N	15.90	46.00	12.07	Compliance
3.800	41.73	QP	9.000	N	15.89	56.00	14.27	Compliance
3.800	26.60	AV	9.000	N	15.89	46.00	19.40	Compliance
6.950	37.83	QP	9.000	N	15.92	60.00	22.17	Compliance
6.950	22.30	AV	9.000	N	15.92	50.00	27.70	Compliance

#### Note:

1) Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

2) Margin (dB) = Limit (dB $\mu$ V) – Corrected Amplitude (dB $\mu$ V)

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# FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

## **Applicable Standard**

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

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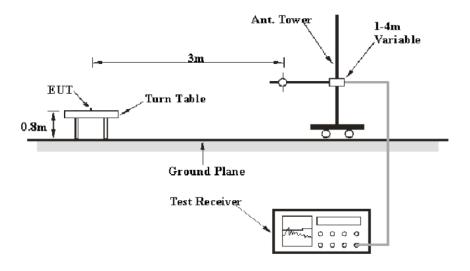
Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750 **	125 to 375 **
174-260	3750	375
260-470	3750 to 12500 **	375 to 1250**
Above 470	12500	1250

- (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.

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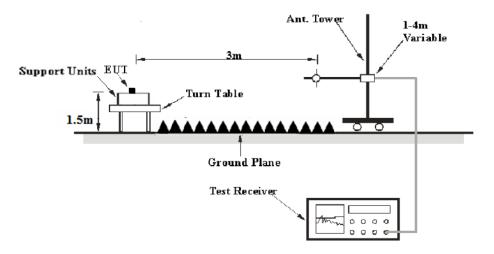
# **EUT Setup**

### **Below 1GHz:**



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#### **Above 1 GHz:**



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15  $\S$  15.209, 15.205 and 15.231.

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## **EMI Test Receiver Setup**

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	/	QP
1000MHz – 5000MHz	1MHz	3MHz	/	PK

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#### **Test Procedure**

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

## **Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude ( $dB\mu V/m$ ) = Meter Reading ( $dB\mu V$ ) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

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. The equation for margin calculation is as follows:

Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V/m)

## **Test Results Summary**

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b).

#### **Test Data**

### **Environmental Conditions**

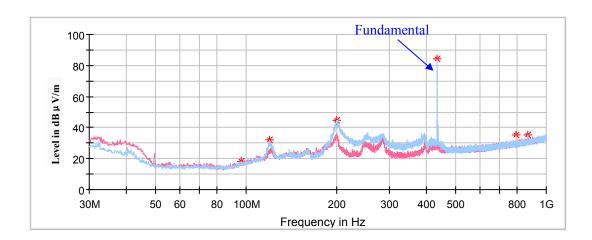
Temperature:	24.3 ℃-24.5℃
Relative Humidity:	51 %-52 %
ATM Pressure:	101.2 kPa -101.3 kPa

The testing was performed by Hope Zhang from 2018-10-11 to 2018-11-24.

Test mode: Transmitting

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**30MHz-1GHz** (Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)



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Corrected		Rx Antenna		T (11)	Corrected	T !!/	
Frequency (MHz)	Amplitude MaxPeak (dBµV /m)	Height (cm)	Polar (H/V)	Turntable Degree	Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
96.445000	18.15	200.0	Н	119.0	-15.8	60.82	42.67
119.603750	31.88	200.0	Н	108.0	-11.3	43.50	11.62
200.356250	44.81	200.0	Н	292.0	-12.3	60.82	16.01
433.923750	84.42	200.0	Н	82.0	-7.7	100.82	16.40
792.056250	35.43	100.0	Н	213.0	-1.8	60.82	25.39
867.841500	35.29	100.0	Н	104.0	-0.6	80.82	45.53

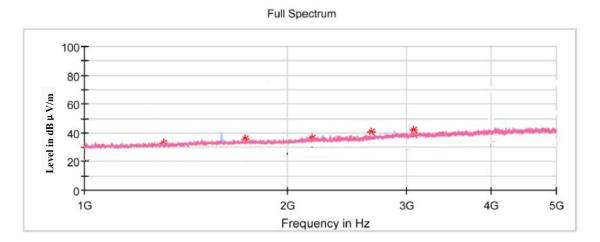
Field Strength of Average Emission

Frequency	Peak Measurement@3m	Height	Polar	Duty Cycle Corrected	Corrected Ampitude	FCC F 15.231(b)//	
(MHz)	(dBµV/m)	(cm)	(H/V)	Factor (dB)	(dBµV/m)	Limit (dBµV/m)	Margin (dB)
433.92	84.42	200	Н	-5.63	78.79	80.82	2.03
867.84	35.29	100	Н	-5.63	29.66	60.82	31.16

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1GHz-5 GHz

(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)



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-	Corrected			T. (11)	Corrected	T	
Frequency (MHz)	Amplitude MaxPeak (dBµV /m)	Height (cm)	Polar (H/V)	Turntable Degree	Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
1301.760000	32.87	100.0	Н	308.0	-8.7	74.00	41.13
1735.680000	35.67	150.0	V	134.0	-6.7	80.82	45.15
2169.600000	36.16	200.0	Н	113.0	-5.3	80.82	44.66
2603.5200000	40.50	100.0	Н	0.0	-3.5	80.82	40.32
3037.440000	42.00	200.0	V	211.0	-1.5	80.82	38.82

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#### Field Strength of Average Emission

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Frequency Peak Measurement@3m		Height	Polar	Duty Cycle Corrected	Corrected Ampitude	FCC F 15.231(b)//	
(MHz)	(dBμV/m)	(cm)	(H/V)	Factor (dB)	(dBµV/m)	Limit (dBµV/m)	Margin (dB)
1301.76	32.87	100	Н	-5.63	27.24	54.00	26.76
1735.68	35.67	150	V	-5.63	30.04	60.82	30.78
2169.6	36.16	200	Н	-5.63	30.53	60.82	30.29
2603.52	40.50	100	Н	-5.63	34.87	60.82	25.95
3037.44	42.00	200	V	-5.63	36.37	60.82	24.45

#### Note 1:

 $\label{eq:corrected} \begin{array}{l} \text{Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) - Amplifier Factor (dB)} \\ \text{Margin (dB) = Limit (dB} \mu V/m) - \text{Corrected Amplitude (dB} \mu V/m) \end{array}$ 

#### Note 2:

Calculate average value based on duty cycle corrected factor:

 $T_p=100ms$ 

 $T_{on}$ = Burst1\*N1 + Burst2\*N2 = 0.445ms\*31+1.243ms\*31 = 52.328ms

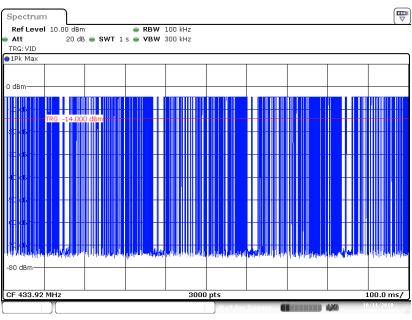
Duty Cycle Corrected Factor =  $20*log(T_{on}/T_p) = 20*log(52.328ms/100ms) = -5.63dB$ 

Average value = Peak value + Duty Cycle Corrected Factor

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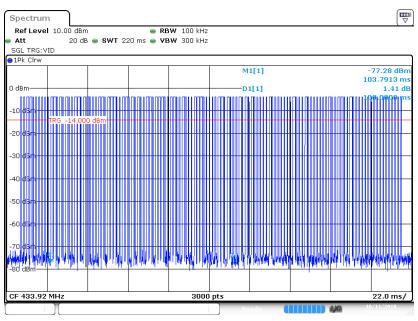
## **Duty Cycle**

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Date:11.0CT.2018 11:08:10

### Duty Cycle (Tp=100ms, N1=31, N2=31)

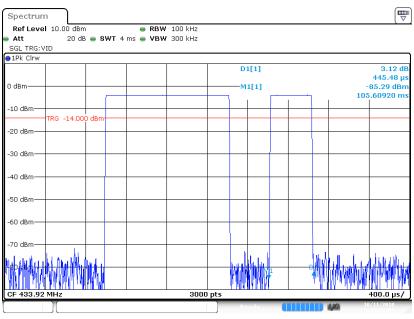


Date:11.0CT.2018 12:05:56

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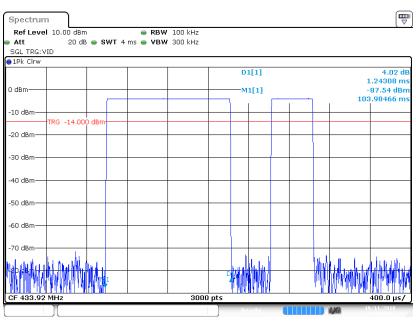
### Duty Cycle Burst 1 (Ton=0.445)

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Date:11.0CT.2018 12:19:27

# Duty Cycle Burst 2 (Ton=1.243)



Date:11.0CT.2018 12:18:07

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# FCC §15.231(a) (1) - DEACTIVATION TESTING

## **Applicable Standard**

Per FCC §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.

Report No.: RSHA180910002-00A

### **Test Procedure**

- 1. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a spectrum analyzer, then turn on the EUT and make it operate in transmitting mode.
- 2. Set center frequency of spectrum analyzer=operating frequency.
- 3. Set the spectrum analyzer as RBW=100k VBW=300k Span=0Hz.
- 4. Repeat above procedures until all frequency measured was complete.

#### **Test Data**

#### **Environmental Conditions**

Temperature:	24.3 ℃
Relative Humidity:	53 %
ATM Pressure:	101.2 kPa

The testing was performed by Hope Zhang on 2018-10-11.

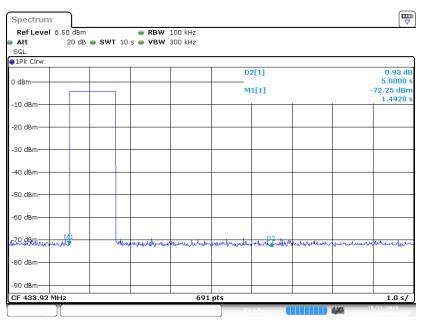
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Test mode: Transmitting

## **OOK Modulation**

 $T_{\text{stop}} < 5s$ 

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# FCC §15.231(c) - 20dB EMISSION BANDWIDTH TESTING

### **Applicable Standard**

Per 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. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Report No.: RSHA180910002-00A

#### **Test Procedure**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

#### **Test Data**

#### **Environmental Conditions**

Temperature:	24.3 ℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Hope Zhang on 2018-10-11.

Test Mode: Transmitting

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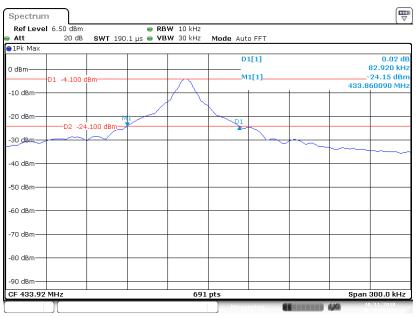
### **OOK Modulation:**

Channel Frequency	20dB Bandwidth	Limit	Result
(MHz)	(kHz)	(kHz)	
433.92	82.92	1084.8	Pass

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**Note:** Limit = 0.25% \* Center Frequency = 0.25% \* 433.92 MHz = 1084.8 kHz

### 20 dB Emission Bandwidth



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\*\*\*\*\* END OF REPORT \*\*\*\*\*

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