

FCC Test Report

FCC Rule(s): FCC Part 15.231

Applicant: Comelit Group Spa

Product Name: Smart video doorbell

Model: <u>CM96201FRW-CMS</u>

FCC ID: 2ANSRCM96201FRW-CMS

Report No.: <u>ZKS170900084E-2</u>

Tested Date: 2017-07-01 to 2017-07-06

Issued Date: <u>2017-07-07</u>

Tested By: <u>Lieber Ouyang (Engineer)</u>

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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen ZRLK Testing Technology Co., Ltd.

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1. General Information

1.1 Product Information

Applicant and Manufacturer	
Applicant:	Comelit Group Spa
Address of Applicant:	via Don Arrigoni 5 san Lorenzo di Rovetta Bergamo Ttaly
Manufacturer:	Zhong Shan Jesmay Electronics Co., Ltd
Address of Manufacturer:	First Industry District, Tan Zhou Canton, Zhong Shan, China

General Description of EU	T
Product Name:	Smart video doorbell
Model No.:	CM96201FRW-CMS
Trade Name:	Comelit
Adding Model(s):	
Class of Equipment:	DSC
Rated Voltage:	DC 12V
TX Frequency:	433.92MHz
Modulation:	ASK
Type of Antenna:	Integral Antenna
Antenna Gain:	0dBi
Note 1: The test data is gath	ered from a production sample, provided by the manufacturer.

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1.2 Compliance Standards

Compliance Standards or Rules				
ECC Dont 15 Submont C	FEDERAL COMMUNICATIONS COMMISSION, RADIO FREQUENCY			
FCC Part 15 Subpart C	DEVICES, Intentional Radiators			
FCC Part 15.231	Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz.			
The objective of the man	ufacturer or applicant is to demonstrate compliance with the above standards.			
According to standards	for test methodology			
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices			
AINSI C03.10-2013	Accredited Standards Committee C63®—Electromagnetic Compatibility			
All measurements contained in this report were conducted with all above standards				
Maintenance of compliance is the responsibility of the manufacturer or applicant. Any modification of the				
product, which result is lowering the emission, should be checked to ensure compliance has been maintained.				

1.3 Test Facilities

Testing Lab: Global United Technology Services Co., Ltd.

The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is **L5775**.

The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 600491.

The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 9079A-2.

All measurement facilities used to collect the measurement data are located at No.301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

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1.4 Test Setup Information

List of Test Modes							
Test Mode Description Remark							
TM1 433.92MHz Tx							
TM2 Operating							
List and Details of Auxilian	List and Details of Auxiliary Equipment						
Description	Manufacturer	Model	Serial Number				
AC-AC transformer	Jesmay	1610					
AC-DC transformer	Jesmay	Art.3522					

Note 1: The equipment under test (EUT) was configured to measure its highest possible emission and immunity level. The test modes were adapted according to the operation manual for use.

Note 2: The 433.92MHz been tested under continuous transmission mode

1.5 Measurement Uncertainty

Parameter	Conditions	Uncertainty
Conducted Emissions	9kHz~30MHz	$\pm 2.79~\mathrm{dB}$
Radiated Emissions	30MHz ∼ 1GHz	\pm 3.45 dB
Radiated Emissions	1Hz∼6GHz	$\pm 3.67 \mathrm{dB}$

1.6 List of Test and Measurement Instruments

Description	Manufacturer	Model	Cal. Date	Due. Date	
EMI Test Receiver	R&S	ESCI 7	April.25 2017	April. 24 2018	
Coaxial Switch	ANRITSU CORP	MP59B	April.25 2017	April. 24 2018	
Artificial Mains Network	SCHWARZBECK	NSLK8127	April.25 2017	April. 24 2018	
ESU EMI Test Receiver	R&S	ESU26	April.25 2017	April. 24 2018	
BiConiLog Antenna	SCHWARZBECK	VULB9163	April.25 2017	April. 24 2018	
Double-ridged horn antenna	SCHWARZBECK	9120D	April.25 2017	April. 24 2018	
Loop Antenna	SCHWARZBECK	FMZB 1519	April.25 2017	April. 24 2018	
RF Amplifier	HP	8347A	April.25 2017	April. 24 2018	
Broadband Preamplifier	SCHWARZBECK	BBV9718	April.25 2017	April. 24 2018	
EMI Test Software	AUDIX	E3	N/A	N/A	
Coaxial Cable	GTS	9kHz-1GHz	April.25 2017	April. 24 2018	
Coaxial Cable	GTS	1GHz-18GHz	April.25 2017	April. 24 2018	
Spectrum Analyzer	Agilent	E4407B	April.25 2017	April. 24 2018	

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2. Summary of Test Results

FCC Rules	Description of Test Items	Result
FCC Part 15.203	Antenna Requirement	Passed
FCC Part 15.205	Restricted Band of Operation	Passed
FCC Part 15.209	Radiated Spurious Emissions	Passed
FCC Part 15.231(a)	Deactivation Testing	Passed
FCC Part 15.231(b)	Radiated Emissions	Passed
FCC Part 15.231(c)	20dB Bandwidth Testing	Passed
FCC Part 15.207(a)	Conducted Emissions	Passed

Passed: The EUT complies with the essential requirements in the standard

Failed: The EUT does not comply with the essential requirements in the standard

N/A: Not applicable

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3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 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. 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.

3.2 Test Result

This product has a permanent antenna, fulfill the requirement of this section.

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4. Radiated Emissions

4.1 Standard and Limit

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

Frequency of Emission	Field Strength of Fundamental	Field Strength of Spurious
(MHz)	(uV/m)	Emissions (uV/m)
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
linear interpolations		

Limits at a measurement distance of 3 m

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.

The general limits in FCC Part 15.209

Engage of Engineer (MIL)	Field Strength (uV/m)	Field Streng	Field Strength (dBuV/m)		
Frequency of Emission (MHz)	QP	QP	AV		
30-88	100	40			
88-216	150	43.5			
216-960	200	46			
Above 960	500	54	74		
Limits at a measurement distance of 3 m					

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious radiated emissions measurements starting below or at the lowest crystal frequency.

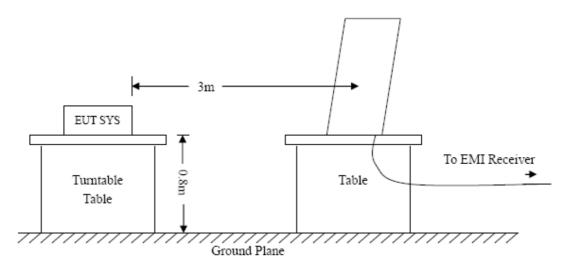
Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

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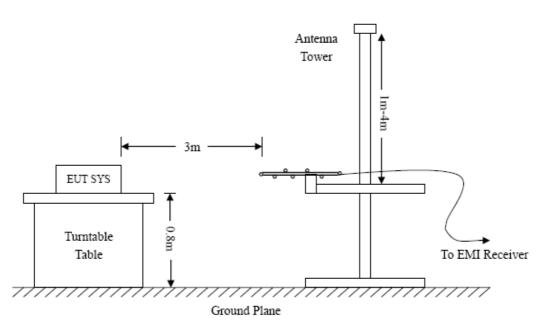


4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.



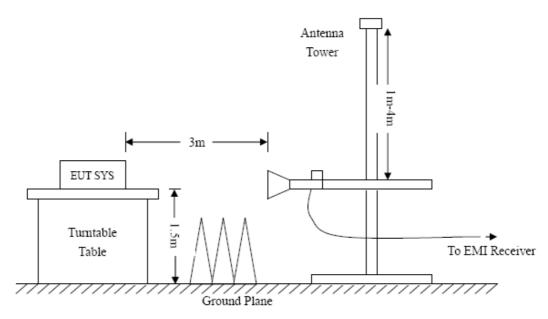
Test Setup Block Diagram below 30MHz



Test Setup Block Diagram for 30MHz-1GHz

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Test Setup Block Diagram above 1GHz

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

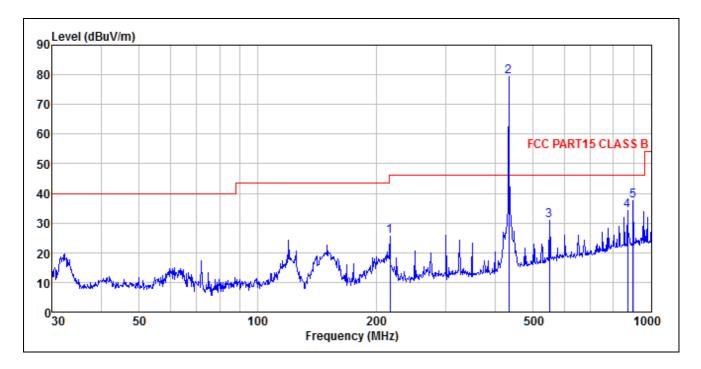
4.3 Test Data and Results

According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

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Test Plots and Data of Radiated Emissions (30MHz to 1GHz)				
Tested Model: CM96201FRW-CMS				
Tested Mode: TM1				
Test Power Specification: AC 120 V/60Hz				
Test Antenna Polarization: Horizontal				



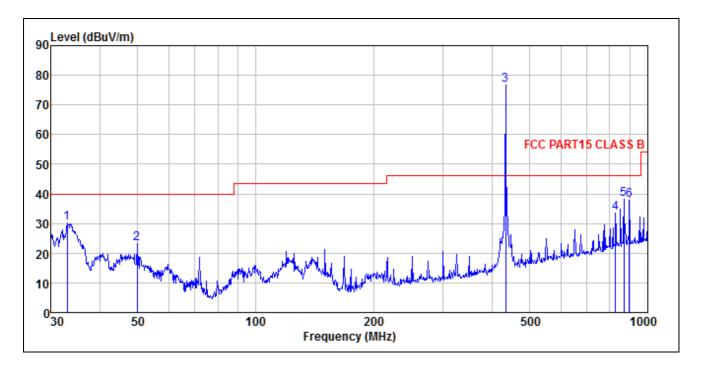
No.	Frequency	Factor	Results	Limit	Margin	Detector	Table	Height	ANT
	(MHz)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		(°)	(cm)	
1	216.783	16.64	25.54	46	-20.46	Peak	234.1	100	Horizontal
2	433.920	10.24	79.23	100.8	-21.57	Peak	160.2	100	Horizontal
3	550.948	7.37	30.95	46	-15.05	Peak	192.3	100	Horizontal
4	867.840	2.45	34.14	46	-11.86	Peak	80.9	100	Horizontal
5	896.997	2.10	37.58	46	-8.42	Peak	66.3	100	Horizontal

No.	Frequency	PK Results	Factor _{DC}	AV Results	Limit	Margin
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1	433.92	79.23	-8.51	70.72	80.8	-10.08

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Test Plots and Data of Radiated Emissions (30MHz to 1GHz)					
Tested Model:	CM96201FRW-CMS				
Tested Mode:	TM1				
Test Power Specification: AC 120 V/60Hz					
Test Antenna Polarization:	Test Antenna Polarization: Vertical				



No.	Frequency	Factor	Results	Limit	Margin	Detector	Table	Height	ANT
	(MHz)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		(°)	(cm)	
1	33.095	18.24	30.24	40	-9.76	Peak	100.8	100	Vertical
2	49.881	17.03	23.10	40	-16.90	Peak	88.9	100	Vertical
3	433.920	10.24	76.57	100.8	-24.23	Peak	50.3	100	Vertical
4	827.493	3.04	33.57	46	-12.43	Peak	140.2	100	Vertical
5	867.84	2.47	38.31	46	-7.69	Peak	45.2	100	Vertical
6	896.997	2.10	37.92	46	-8.08	Peak	92.9	100	Vertical

No.	Frequency	PK Results	Factor _{DC}	AV Results	Limit	Margin
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1	433.92	76.57	-8.51	68.06	80.8	-12.74

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Test Plots and Data of Radiated Emissions (1GHz to 5GHz)				
Tested Model:	CM96201FRW-CMS			
Tested Mode:	TM1			
Test Power Specification: AC 120 V/60Hz				
Test Antenna Polarization:	Test Antenna Polarization: Horizontal			

No.	Frequency	Factor	Results	Limit	Margin	Detector	Table	Height	ANT
	(MHz)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		(°)	(cm)	
1	1301.76	12.32	33.21	74.0	-40.79	Peak	161.4	100	Horizontal
2	1735.68	12.05	34.46	80.8	-46.34	Peak	169.2	100	Horizontal
3	2169.60	11.65	37.22	80.8	-43.78	Peak	167.8	100	Horizontal
4	2603.52	11.24	39.81	80.8	-40.99	Peak	165.7	100	Horizontal

No.	Frequency	PK Results	Factor _{DC}	AV Results	Limit	Margin
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1	1301.76	33.21	-8.51	24.70	54.0	-29.30
2	1735.68	34.46	-8.51	25.95	60.8	-34.85
3	2169.60	37.22	-8.51	28.71	60.8	-32.09
4	2603.52	39.81	-8.51	31.30	60.8	-29.50

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Test Plots and Data of Radiated Emissions (1GHz to 5GHz)					
Tested Model: CM96201FRW-CMS					
Tested Mode:	TM1				
Test Power Specification: AC 120 V/60Hz					
Test Antenna Polarization:	Test Antenna Polarization: Vertical				

No.	Frequency	Factor	Results	Limit	Margin	Detector	Table	Height	ANT
	(MHz)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		(°)	(cm)	
1	1301.76	12.32	35.66	74.0	-38.34	Peak	45.2	100	Vertical
2	1735.68	12.05	36.21	80.8	-44.59	Peak	47.3	100	Vertical
3	2169.60	11.65	37.57	80.8	-43.23	Peak	48.1	100	Vertical
4	2603.52	11.24	40.66	80.8	-40.14	Peak	50.8	100	Vertical

No.	Frequency	PK Results	Factor _{DC}	AV Results	Limit	Margin
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1	1301.76	35.66	-8.51	27.15	54.0	-26.85
2	1735.68	36.21	-8.51	27.70	60.8	-33.10
3	2169.60	37.57	-8.51	29.06	60.8	-31.74
4	2603.52	40.66	-8.51	32.15	60.8	-28.65

Note 1: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which 3^{rd} and 10^{th} Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz.

Note 2: Average Result = Peak Result + Factor_{DC} (Duty Cycle Correction Factor)

Note 3: Duty Cycle Correction Factor = 20log (Duty Cycle) = 20log(0.3756) = -8.51

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5. 20dB Bandwidth

5.1 Standard and Limit

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

5.2 Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set center frequency = transmitting channel;

Span = 200 kHz; RBW ≥1% 20dB Bandwidth, VBW≥RBW

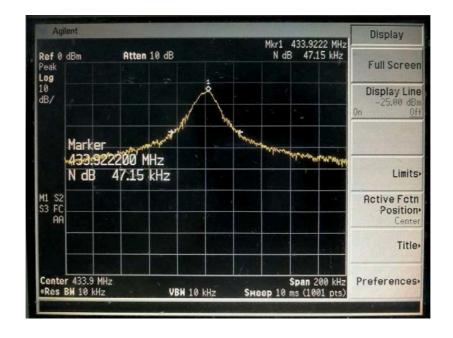
Sweep = auto; Detector function = peak; Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

5.3 Test Data and Results

Test Frequency	Test Frequency 20dB Bandwidth		Result
MHz	kHz	kHz	
433.92	47.15	1084	Passed
Limit = Fundamental Frequ	$\frac{1}{1}$ $\frac{1}$	$z \times 0.25\% = 1084 \text{ kHz}$	

Limit = Fundamental Frequency X 0.25% = 433.92 MHz X 0.25% = 1084 kHz



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6. Transmission Time

6.1 Standard and Limit

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:

- 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.

6.2 Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set center frequency = transmitting channel;

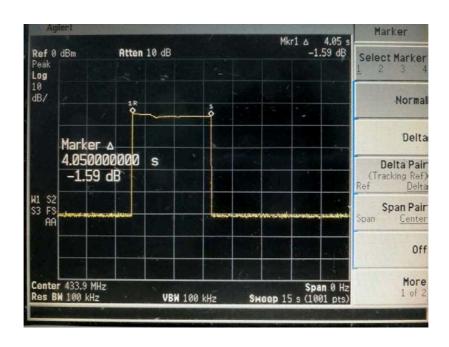
Span = 0Hz; RBW=100 kHz; VBW≥RBW

Sweep = 15s and Single Sweep; Detector function = peak; Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the transmission time.

6.3 Test Data and Results

Transmission Type	Test Frequency	Transmission Time	Limit	Result
	MHz	S	S	
Manually	433.92	4.05	5	Passed



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7. Duty Cycle

7.1 Standard Applicable

According to FCC Part 15.231(b)(2) and 15.35(c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

7.2 Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set center frequency = transmitting channel;

Span = 0Hz; RBW=100 kHz; VBW≥RBW

Sweep = auto and single sweep; Detector function = peak; Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the transmission time.

7.3 Test Data and Results

Type of Pulse	Width of Pulse	Quantity of Pulse	Transmission Time	Total Time (Ton)
	ms		ms	ms
Pulse 1	0.21	19	3.99	
Pulse 2	0.60	5	3	8
Pulse 3	1.01	1	1.01	
	<u> </u>	I	I	

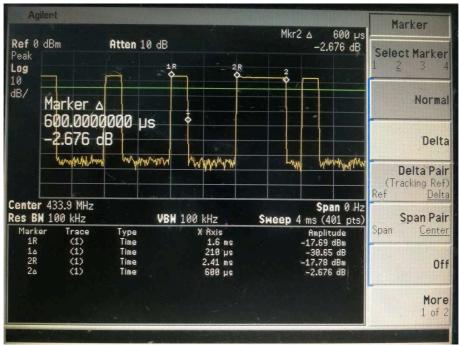
Test Period (Tp)	Total Time (Ton)	Duty Cycle	Duty Cycle Factor
ms	ms		dB
21.3	8	0.3756	-8.51
Duty cycle factor = 20 * Log(Duty cycle)			

Please refer to the attached test plots

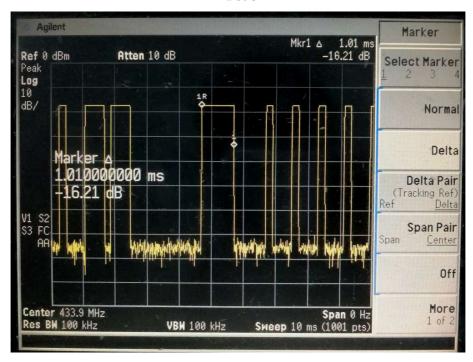
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Width of Pulse 1 and Pulse 2



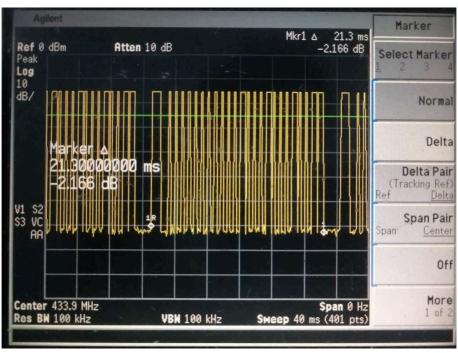
Pulse 3



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Quantity of Pulse



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8. Conducted Emissions

8.1 Standard and Limit

According to the rule FCC Part 15.207, Conducted limit, the limit for a class B device as below:

Eraguanay of Emission (MHz)	Conducted Limit (dBuV)		
Frequency of Emission (MHz)	Quasi-peak	Average	
0.15-0.5	66 to 56	56 to 46	
0.5-5	56	46	
5-30	60	50	

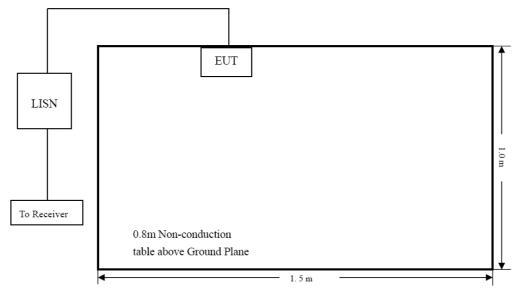
Note 1: Decreases with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz

Note 2: The lower limit applies at the band edges

AC Power Line

8.2 Test Procedure

Test is conducting under the description of ANSI C63.10-2013 measurement procedure.



Test Setup Block Diagram

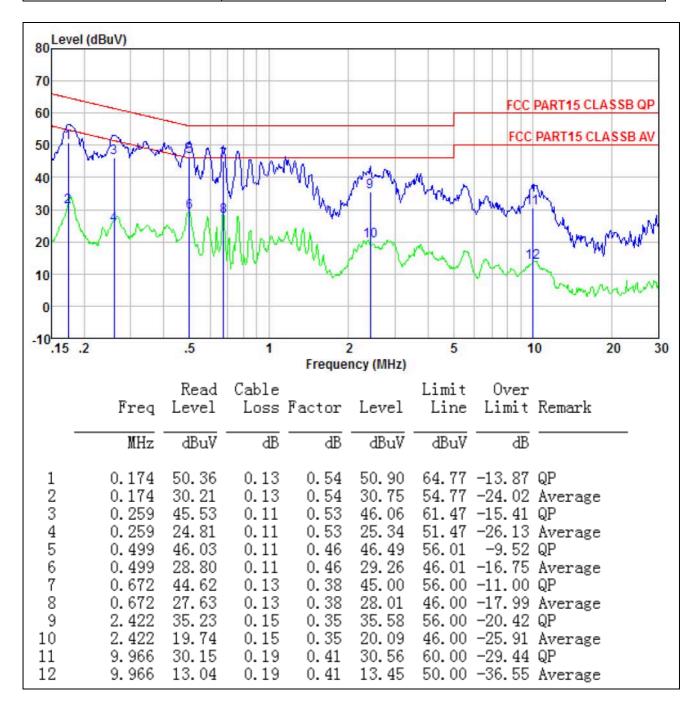
8.3 Test Data and Results

Based on all tested data, the EUT complied with the FCC Part 15.207 standard limit for a Class B device, and with the worst case as below:

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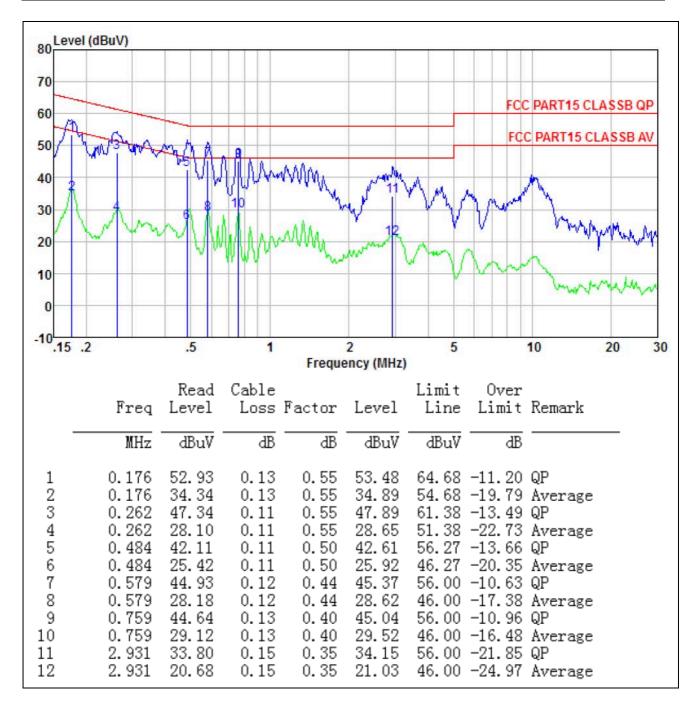
Test Plots and Data of Conducted Emissions		
Tested Model:	CM96201FRW-CMS	
Tested Mode:	TM2	
Test Power Specification:	AC 120V/60Hz	
Test Power Line:	Neutral	



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Test Plots and Data of Conducted Emissions		
Tested Model:	CM96201FRW-CMS	
Tested Mode:	TM2	
Test Power Specification:	AC 120V/60Hz	
Test Power Line:	Line	



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Annex A. EUT External Photos

EUT View 1



EUT View 2



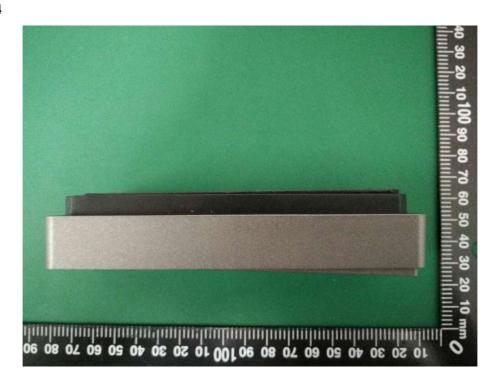
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EUT View 3



EUT View 4



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EUT View 5



EUT View 6



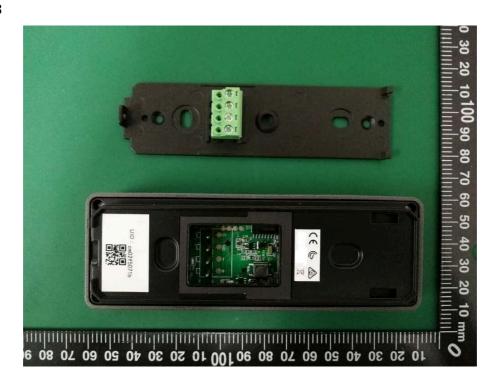
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EUT View 7



EUT View 8

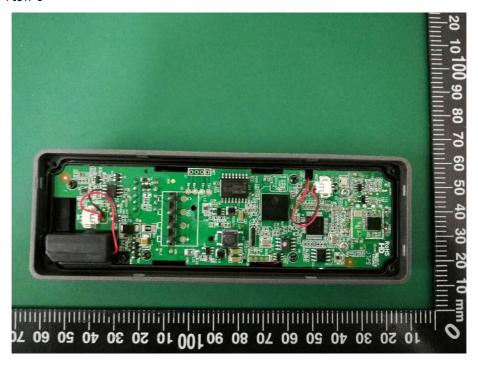


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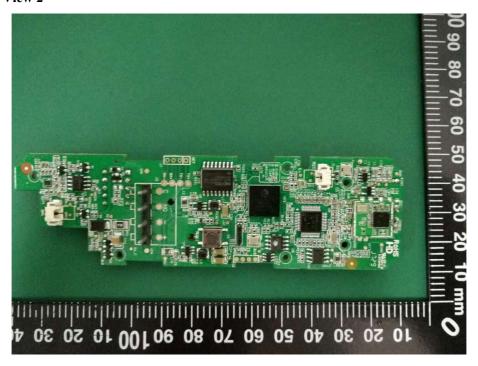


Annex B. EUT Internal Photos

EUT Internal View 1



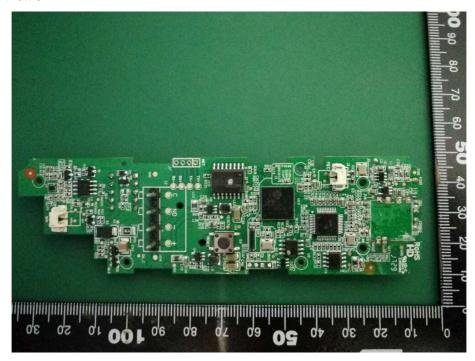
EUT Internal View 2

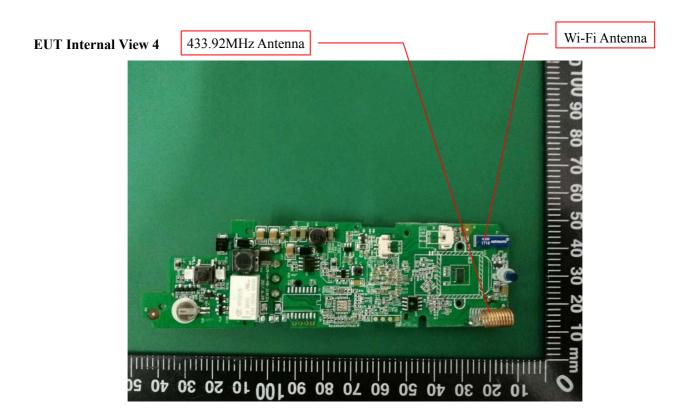


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EUT Internal View 3

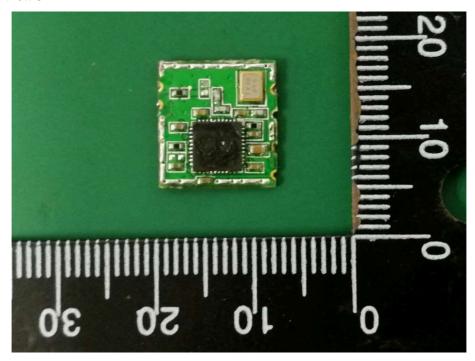




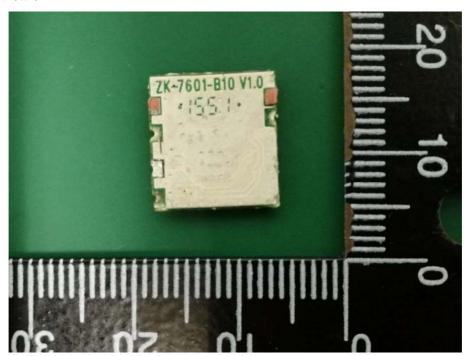
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EUT Internal View 5



EUT Internal View 6



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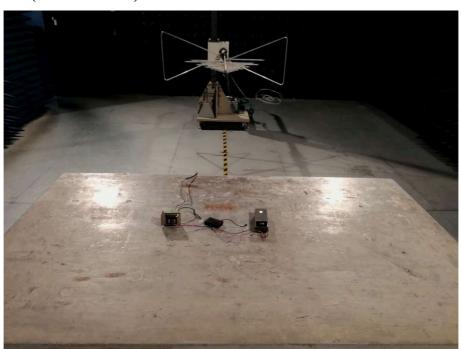


Annex C. Test Photos

Conducted Emission



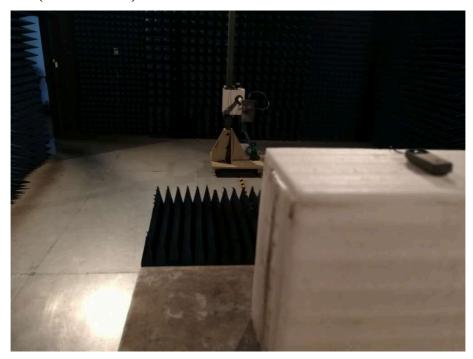
Radiated Emissions (30MHz to 1GHz)



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Radiated Emissions (1GHz to 5GHz)



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Annex D. Label and Information

FCC Label Sample

FCC ID: 2ANSRCM96201FRW-CMS

FCC Label Specifications

Text is Black in color and is justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened onto the EUT or shall be affixed at a conspicuous location on the EUT. Where the EUT is constructed in two or more sections connected by wires and marketed together, the above statement is required to be affixed only to the main control unit. When the EUT is so small or for such use that it is not practicable to place the statement on it, the above information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

FCC Label Location



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

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