

FCC Part 15C Test Report

FCC ID: 2ATM77706

Product Name:	Garage Door Sensor 2
Trademark:	N/A
Model Name :	YS7706-UC YS7706-UA
Prepared For :	YoSmart Inc.
Address :	17165 Von Karman Avenue, Suite 105, Irvine CA, 92614, USA
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
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Test Date:	Mar. 04, 2020 – Mar. 11, 2020
Date of Report :	Mar. 11, 2020
Report No.:	BCTC2003000202E



TEST RESULT CERTIFICATION

Applicant's name: YoSmart Inc.

Address : 17165 Von Karman Avenue, Suite 105, Irvine CA, 92614,

USA

Manufacture's Name.....: YoSmart Inc.

Address: 17165 Von Karman Avenue, Suite 105, Irvine CA, 92614,

USA

Product description

Product name Garage Door Sensor 2

Model and/or type reference : N/A

Serial Model YS7706-UC

YS7706-UA

Test Standards: FCC Part15.249

ANSI C63.10-2013

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Prepared by(Engineer): Willem Wang

Reviewer(Supervisor): Eric Yang

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Table of Contents

	Page
1 . SUMMARY OF TEST RESULTS	5
1.1 TEST FACILITY	6
1.2 MEASUREMENT UNCERTAINTY	6
2 . GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF EUT	7
2.2 DESCRIPTION OF TEST MODES	8
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTE	D 9
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	9
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	10
3 . EMC EMISSION TEST	12
3.1 CONDUCTED EMISSION MEASUREMENT	12
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS	12
3.1.2 TEST PROCEDURE	12
3.1.3 DEVIATION FROM TEST STANDARD	12
3.1.4 TEST SETUP	13
3.1.5 EUT OPERATING CONDITIONS 3.1.6 TEST RESULTS	13 13
	_
3.2 RADIATED EMISSION MEASUREMENT 3.2.1 RADIATED EMISSION LIMITS	14 14
3.2.2 TEST PROCEDURE	15
3.2.3 DEVIATION FROM TEST STANDARD	15
3.2.4 TEST SETUP	16
3.2.5 EUT OPERATING CONDITIONS	17
3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)	18
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)	19
3.2.8 TEST RESULTS (ABOVE 1000 MHZ)	21
3.2.9 FIELD STRENGTH CALCULATION	22
4 . 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE	24
4.1 DEVIATION FROM STANDARD	24
4.2 TEST SETUP	24
4.3 EUT OPERATION CONDITIONS 4.4 TEST RESULTS	24 24
5 . BANDWIDTH TEST	27
5.1 APPLIED PROCEDURES / LIMIT	27



Table of Contents

	Page
5.1.1 TEST PROCEDURE	27
5.1.2 DEVIATION FROM STANDARD	27
5.1.3 TEST SETUP	27
5.1.4 EUT OPERATION CONDITIONS	27
5.1.5 TEST RESULTS	28
6 . ANTENNA REQUIREMENT	29
6.1 STANDARD REQUIREMENT	29
6.2 EUT ANTENNA	29
7 . EUT TEST PHOTO	30
8 . PHOTO OF THE EUT	31



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.249) , Subpart C						
Standard Section	Test Item	Judgment	Remark			
15.207	Conducted Emission	N/A				
15.215	20dB Bandwidth	PASS				
15.249	Fundamental &Radiated Spurious Emission Measurement	PASS				
15.205	Band Edge Emission	PASS				
15.203	Antenna Requirement	PASS				

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report



1.1 TEST FACILITY

Shenzhen BCTC Testing Co., Ltd.

Add.: BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou

Report No.: BCTC2003000202E

Community, Fuyong Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 712850

IC Registered No.: 23583

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $\mathbf{y} \pm \mathbf{U}$, where expended uncertainty \mathbf{U} is based on a standard uncertainty multiplied by a coverage factor of $\mathbf{k=2}$, providing a level of confidence of approximately $\mathbf{95}$ %.

No.	Item	Uncertainty
1	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
3	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
4	Conducted Adjacent channel power	U=1.38dB
5	Conducted output power uncertainty Above 1G	U=1.576dB
6	Conducted output power uncertainty below 1G	U=1.28dB
7	humidity uncertainty	U=5.3%
8	Temperature uncertainty	U=0.59 °C



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Garage Door Sensor 2				
Trade Name	N/A				
Model Name	YS7706-UC				
Serial Model	YS7706-UA				
Model Difference	All the model are the smodel names.	same circuit and RF module, except			
	The EUT is a Garage Do	or Sensor 2			
	Operation Frequency:	910.3MHz			
	Modulation Type:	LoRa			
	Number Of Channel	1CH			
Product Description	Antenna Designation:	Please see Note 3.			
	Antenna Gain (dBi) 1dBi				
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.				
Channel List	Please refer to the Note 2.				
Power	DC 3V				
Connecting I/O Port(s)	Please refer to the User's Manual				

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel List for 910.3MHz					
Channel	Frequency (MHz)				
01	910.3				

3. Table for

Table for Spring antenna

- 3		<u> </u>					
	An.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
	Α	N/A	YS7706-UC	Spring antenna	N/A	1	



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Report No.: BCTC2003000202E

For Radiated Emission			
Final Test Mode	Description		
Mode 1	TX Mode		

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported



2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test

E-1 EUT

2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Garage Door Sensor 2	N/A	YS7706-UC	N/A	EUT

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Rac	Radiation Test equipment						
Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45109572	Jun. 13, 2019	Jun. 12, 2020	
2	Test Receiver (9kHz-7GHz)	R&S	ESR7	101154	Jun. 13, 2019	Jun. 12, 2020	
3	Bilog Antenna (30MHz-3GHz)	SCHWARZBE CK	VULB9163	VULB9163-94 2	Jun. 22, 2019	Jun. 21, 2020	
4	Horn Antenna (1GHz-18GHz)	SCHWARZBE CK	BBHA9120D	1541	Jun. 22, 2019	Jun. 21, 2020	
5	Horn Antenna (18GHz-40GHz)	SCHWARZBE CK	BBHA9170	822	Jun. 22, 2019	Jun. 21, 2020	
6	Amplifier (9KHz-6GHz)	SCHWARZBE CK	BBV9744	9744-0037	Jun. 25, 2019	Jun. 24, 2020	
7	Amplifier (0.5GHz-18GHz)	SCHWARZBE CK	BBV9718	9718-309	Jun. 25, 2019	Jun. 24, 2020	
8	Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35- HG	2034381	Jun. 17, 2019	Jun. 16, 2020	
9	Loop Antenna (9KHz-30MHz)	SCHWARZBE CK	FMZB1519B	014	Jul. 02, 2019	Jul. 01, 2020	
10	RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-000 8	Jun. 25, 2019	Jun. 24, 2020	
11	RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	Jun. 25, 2019	Jun. 24, 2020	
12	RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	Jun. 25, 2019	Jun. 24, 2020	
13	Power Metter	Keysight	E4419B	\	Jun. 17, 2019	Jun. 16, 2020	
14	Power Sensor (AV)	Keysight	E9 300A	\	Jun. 17, 2019	Jun. 16, 2020	
15	Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY4910.30060	Jun. 13, 2019	Jun. 12, 2020	
16	Spectrum Analyzer 9kHz-40GHz	Agilent	FSP40	100363	Jun. 13, 2019	Jun. 12, 2020	
17	D.C. Power Supply	LongWei	TPR-6405D	\	\	\	
18	Software	Frad	EZ-EMC	FA-03A2 RE	\	\	



Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESR3	102075	Jun. 13, 2019	Jun. 12, 2020
2	LISN	SCHWARZBEC K	NSLK8127	8127739	Jun. 13, 2019	Jun. 12, 2020
3	LISN	R&S	ENV216	101375	Jun. 13, 2019	Jun. 12, 2020
4	RF cables	Huber+Suhnar	9kHz-30MHz	B1702988-00 08	Jun. 25, 2019	Jun. 24, 2020
5	Software	Frad	EZ-EMC	EMC-CON 3A1	\	\



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

EDEOLIENCY (MU=)	Limit (Ctondord	
FREQUENCY (MHz)	Quasi-peak	Average	Standard
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

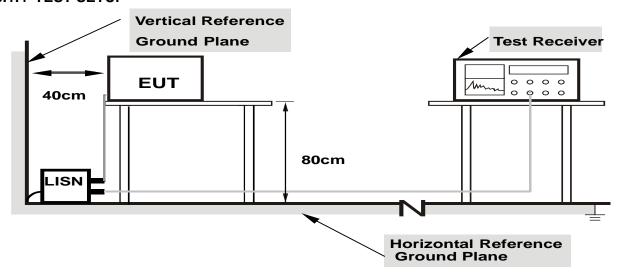
- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation



3.1.4 TEST SETUP



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

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

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

NOTE: This EUT is powered by the battery only, this test item is not applicable.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies	Field Strength	Measurement Distance
(MHz)	(micorvolts/meter)	(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)		
FREQUENCY (MITZ)	PEAK	AVERAGE	
Above 1000	74	54	

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).



Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted	1 MHz / 1 MHz for Dook 1 MHz / 10Hz for Average
band)	1 MHz / 1 MHz for Peak, 1 MHz / <i>10Hz</i> for Average

Receiver Parameter Setting	
Attenuation Auto	
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos. Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

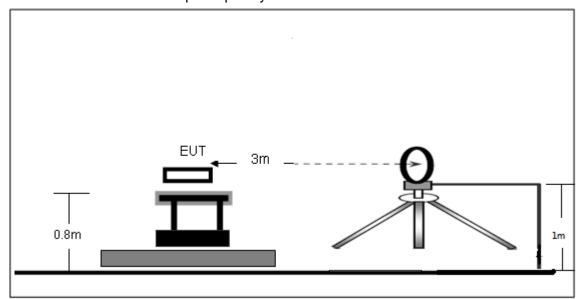
3.2.3 DEVIATION FROM TEST STANDARD

No deviation

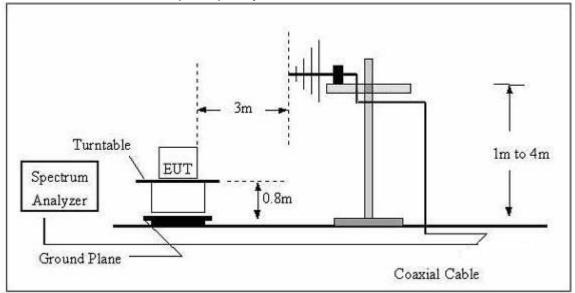


3.2.4 TEST SETUP

(A) Radiated Emission Test-Up Frequency Below 30MHz

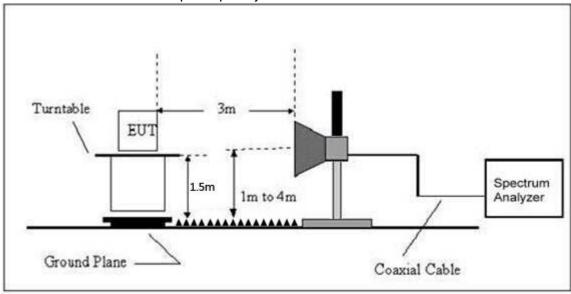


(B) Radiated Emission Test-Up Frequency 30MHz~1GHz





(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



3.2.6 TEST RESULTS (BETWEEN 9KHZ - 30 MHZ)

Temperature:	26℃	Relative Humidtity:	54%
Pressure:	101kPa	Test Voltage:	DC 3V
Test Mode:	Mode 1	Polarization :	

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m) (dB)		P/F
				PASS
				PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

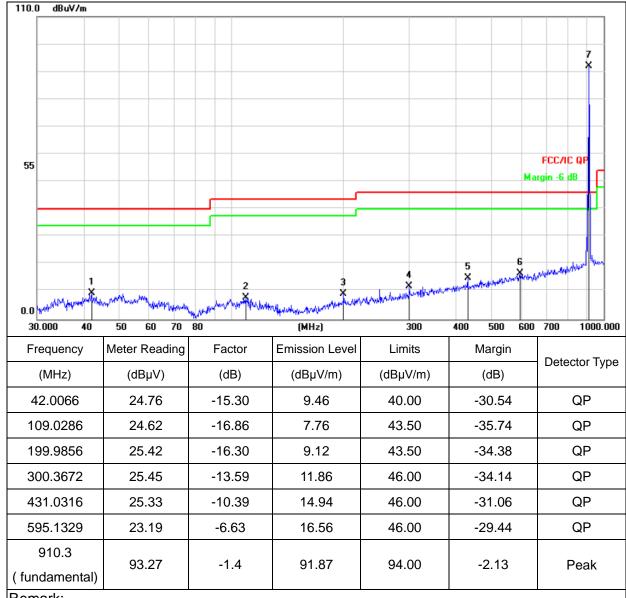
Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.



3.2.7 TEST RESULTS (BETWEEN 30MHZ - 1GHZ)

Temperature :	26℃	Relative Humidity:	54%
Pressure :	101kPa	Polarization :	Horizontal
Test Voltage :	DC 3V		
Test Mode :	Mode 1		



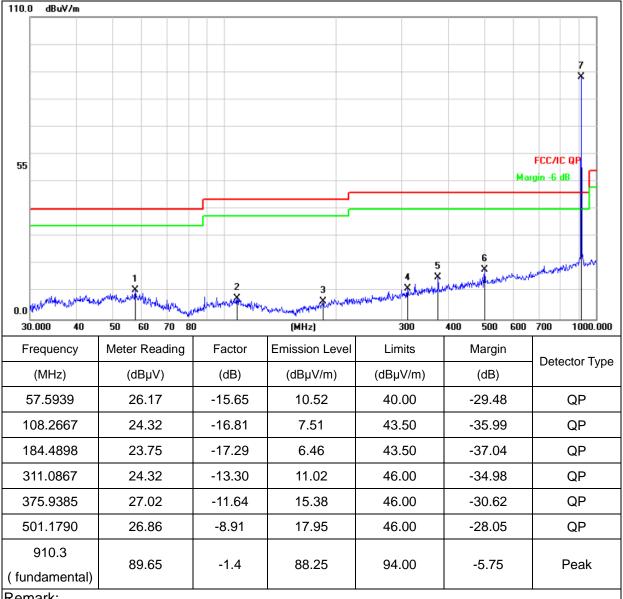
Remark:

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

All interfaces was connected, and TX mode



Temperature :	26 ℃	Relative Humidity:	54%
Pressure :	101kPa	Polarization :	Vertical
Test Voltage :	DC 3V		
Test Mode :	Mode 1		



Remark:

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

All interfaces was connected, and TX mode



3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

Normal Voltage 910.3MHz

Polar	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector
(H/V)	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Туре
V	1820.60	59.92	-3.57	56.35	74	-17.65	Pk
V	1820.60	48.46	-3.57	44.89	54	-9.11	AV
V	2730.90	58.57	-3.84	54.73	74	-19.27	Pk
V	2730.90	48.23	-3.84	44.39	54	-9.61	AV
V	3641.20	58.17	-4.59	53.58	74	-20.42	Pk
V	3641.20	48.66	-4.59	44.07	54	-9.93	AV
Н	1820.60	61.71	-3.62	58.09	74	-15.91	Pk
Н	1820.60	49.36	-3.62	45.74	54	-8.26	AV
Н	2730.90	61.88	-3.93	57.95	74	-16.05	Pk
Н	2730.90	50.54	-3.93	46.61	54	-7.39	AV
Н	3641.20	60.36	-3.57	56.79	74	-17.21	Pk
Н	3641.20	48.25	-3.57	44.68	54	-9.32	AV

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level

Other harmonics emissions are lower than 20dB below the allowable limit.



3.2.9 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS=RA+AF+CL-AG

FS=Field Strength	CL=Cable Attenuation Factor (Cable Loss)
RA=Reading Amplitude	AG=Amplifier Gain
AF=Antenna Factor	

Test Rusult:

Temperature :	26 ℃	Relative Humidity:	54%
Pressure :	101kPa	Polarization :	Horizontal
Test Voltage :	DC 3V		
Test Mode :	Mode 1		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
910.3	93.41	-1.4	92.01	94	-1.99	Peak
910.3	89.13	-1.4	87.73	94	-6.27	Average

Remark:

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

All interfaces was connected, and TX mode

Temperature :	26 ℃	Relative Humidity:	54%
Pressure :	101kPa	Polarization :	Vertical
Test Voltage :	DC 3V		
Test Mode :	Mode 1		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
910.3	91.48	-1.4	90.08	94	-3.92	Peak
910.3	88.32	-1.4	86.92	94	-7.08	Average

Remark:

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

All interfaces was connected, and TX mode



CONDUCTED EMISSION MEASUREMENT

Low Channel 910.3MHz





Report No.: BCTC2003000202E



4. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE APPLICABLE STANDARD

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation

TEST PROCEDURE

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) i) VBW for Peak, Quasi-peak, or Average Detector Function: 3 × RBW
- d) Repeat above procedures until all measured frequencies were complete.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

4.1 DEVIATION FROM STANDARD

No deviation.

4.2 TEST SETUP

4.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.4 TEST RESULTS

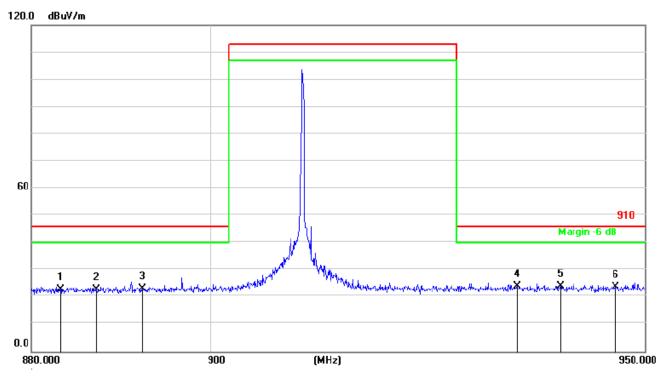


 Temperature :
 26 °C
 Relative Humidity :
 54%

 Pressure :
 101 kPa
 Test Voltage :
 DC 3V

 Test Mode :
 TX Mode

910.3MHz Horizontal

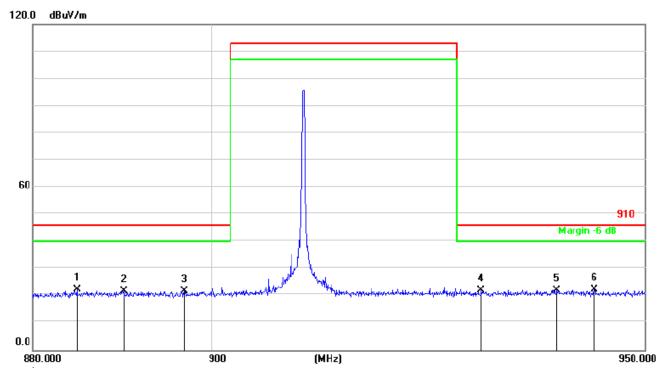


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	883.2200	24.73	-1.84	22.89	46.00	-23.11	peak
2	887.2100	24.63	-1.76	22.87	46.00	-23.13	peak
3	892.2500	24.85	-1.66	23.19	46.00	-22.81	peak
4	* 935.0200	25.47	-1.23	24.24	46.00	-21.76	peak
5	940.1300	25.32	-1.19	24.13	46.00	-21.87	peak
6	946.6400	24.97	-1.14	23.83	46.00	-22.17	peak



910.3MHz Vertical

Report No.: BCTC2003000202E



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	884.9000	24.02	-1.81	22.21	46.00	-23.79	peak
2	890.0800	23.44	-1.70	21.74	46.00	-24.26	peak
3	896.8000	23.36	-1.57	21.79	46.00	-24.21	peak
4	930.8200	23.26	-1.26	22.00	46.00	-24.00	peak
5	939.7100	23.36	-1.19	22.17	46.00	-23.83	peak
6	* 944.1200	23.54	-1.16	22.38	46.00	-23.62	peak



5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.249) , Subpart C				
Section	Test Item	Frequency Range (MHz)	Result	
15.249	Bandwidth	902~928	PASS	

5.1.1 TEST PROCEDURE

- 1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
- 2. Set the video bandwidth (VBW) \geq 3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

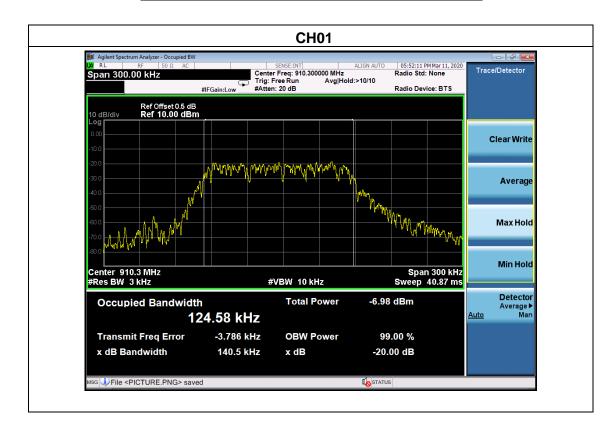
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



5.1.5 TEST RESULTS

Temperature :	26℃	Relative Humidity:	54%
Pressure :	101kPa	Test Voltage :	DC 3V
Test Mode :	TX Mode	•	

Channel	Frequency (MHz)	20dB bandwidth (MHz)
01	910.3	0.141





6. ANTENNA REQUIREMENT

6.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

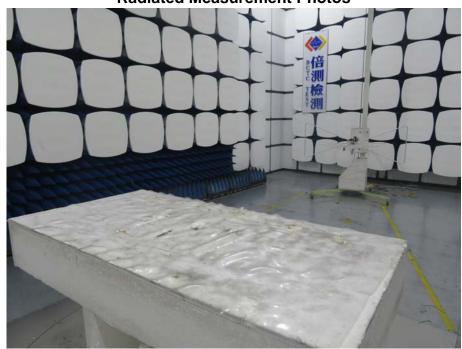
6.2 EUT ANTENNA

The EUT antenna is Spring antenna. It comply with the standard requirement.



7. EUT TEST PHOTO



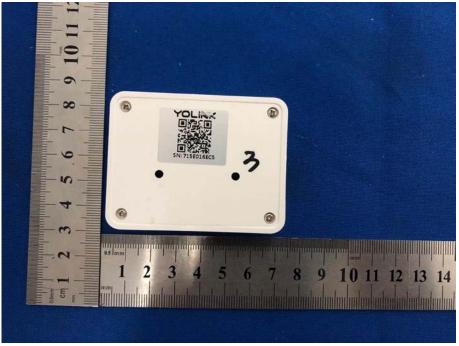






8. PHOTO OF THE EUT





**** END OF REPORT ****