



TEST REPORT

APPLICANT	:	Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd.
PRODUCT NAME	:	10.1 inch WIFI Digital Photo Frame
MODEL NAME	:	Skylight,D104
BRAND NAME	:	N/A
FCC ID	:	2AABK-SKYLIGHT
STANDARD(S)	:	47 CFR Part 15 Subpart C
TEST DATE	:	2018-03-05 to 2018-03-08
ISSUE DATE	:	2018-03-21

Tested by:

Li Jung Zong

Li Jingzong (Test Engineer)

Approved by:

Andy Yeh (Technical Director)

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Change History					
Issue	Date	Reason for change			
1.0	2018-03-21	First edition			



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1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd.			
Applicant Address:	4F & 6F, Overseas plant south, Skyworth Industrial Park, Shiyar			
	Street, Bao'an District, Shenzhen, P.R. China			
Manufacturer:	Shenzhen Chuangwei Electronic Appliance Tech Co., Ltd.			
Manufacturer Address:	4F & 6F, Overseas plant south, Skyworth Industrial Park, Shiyan			
	Street, Bao'an District, Shenzhen, P.R. China			

1.2. Equipment Under Test (EUT) Description

Product Name:	10.1 inch WIFI Digital Photo Frame
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	D104-MB-D4-V01
Software Version:	D104.V0.10
Modulation Type:	DSSS, OFDM
Operating Frequency Range:	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz
Channel Number:	802.11b/g/n-20MHz: 11
Antenna Type:	Dipole Antenna
Antenna Gain:	1.91 dBi

Note 1: The EUT is operating at 2.4GHz ISM; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.

For 802.11b/g/n-20MHz (2.4GHz band), the frequencies allocated is F (MHz) =2412+5*(n-1) (1<=n<=11). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).

Note 2: According to the designer, they declared that the model Skylight and D104 are accordant in both hardware and software, these two models only differ in model number, gift box design and package. The application information of two models is identical only except above mentioned point. **Note 3:** The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT continuous transmission.

Note 4: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.





1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No	Identity		Document Title					
1	1 47 CFR Part 15 (10-1-15 Edition)			Radio Frequency Devices				
Test d	etailed items	/section required by FCC ru	les and	d results are as t	pelow:			
No.	Section	Description		Test Date	Test Engineer	Result		
1	15.203	Antenna Requirement		N/A	N/A	PASS		
2	15.247(b)	Peak Output Power		Mar 05, 2018	Li Jingzong	PASS		
3	15.247(a)	Bandwidth		Mar 05, 2018	Li Jingzong	PASS		
4	1E 017(d)	Conducted Spurious Emi	ucted Spurious Emission		Li Jingzong	DACC		
4	15.247 (u)	and Band Edge		Mai 00, 2016		PASS		
5	15.247(d)	Restricted Frequency Band	ds	Mar 06, 2018	Wu Junke	PASS		
6	15.207	Conducted Emission		Mar 06, 2018	Wu Junke	PASS		
7	15.209,	Padiated Emission		Mar 06&08,		DAGG		
· ·	15.247(d)	Radiated Emission		2018	wu Julike	FA33		
8	15.247(e) Power spectral density (PSD)			Mar 06, 2018	Li Jingzong	PASS		
Note	Note1: The tests of Conducted Emission and Radiated Emission were performed according to					ording to		
the method of measurements prescribed in ANSI C63.10 2013 and KDB558074 D01 v04								
(04/0	5/2017).							

1.4. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106





2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 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.

2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Peak Output Power

2.2.1. Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed1 Watt.

2.2.2. Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

A. Test Setup:







The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

B. Equipments List:

Please refer ANNEX A(1.5).

2.2.3. Test Result

Channel	Fraguanay (MHz)	Measured C	output Peak Power	Limit		V a nali a t
Channel		dBm	W	dBm	W	verdict
1	2412	15.50	0.03548			PASS
6	2437	15.41	0.03475	30	1	PASS
11	2462	15.27	0.03365			PASS

2.2.3.1 802.11b Test Mode

Channel Frequency (MHz)		Measured	Output Average Power	Limit		Verdict
		dBm	W	dBm	W	
1	2412	12.56	0.01803			PASS
6	2437	12.35	0.01718	30	1	PASS
11	2462	12.25	0.01679			PASS

2.2.3.2 802.11g Test mode

		Measured C	output Peak Power	Limit		Vordict
Channel	Frequency (MHZ)	dBm	W	dBm	W	verdict
1	2412	21.39	0.13772			PASS
6	2437	21.37	0.13709	30	1	PASS
11	2462	21.78	0.15066			PASS

Channel Frequency (MHz)		Measured	Output Average Power	Limit		Verdict
		dBm	W	dBm	W	
1	2412	11.34	0.01361			PASS
6	2437	11.46	0.01400	30	1	PASS
11	2462	11.74	0.01493			PASS



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2.2.3.3 802.11n-20MHz Test mode

		Measured C	utput Peak Power	Limit		Vordict
Channel	Frequency (MHZ)	dBm	W	dBm	W	veruici
1	2412	20.99	0.12560			PASS
6	2437	21.29	0.13459	30	1	PASS
11	2462	21.20	0.13183			PASS

Channel Frequency (MHz)		Measured	Output Average Power	Limit		Verdict
		dBm	W	dBm	W	
1	2412	10.98	0.01253			PASS
6	2437	11.27	0.01340	30	1	PASS
11	2462	11.16	0.01306			PASS



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2.3.1. Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

KDB 558074 Section 8.1 Option 1 was used in order to prove compliance.

B. Equipments List:

Please refer ANNEX A(1.5).





2.3.3. Test Result

2.3.3.1 802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	8.582	≥500	PASS
6	2437	8.138	≥500	PASS
11	2462	9.052	≥500	PASS

B. Test Plots



(Channel 1, 2412MHz, 802.11b)



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(Channel 6, 2437 MHz, 802.11b)



(Channel 11, 2462MHz, 802.11b)



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2.3.3.2 802.11g Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.31	≥500	PASS
6	2437	16.33	≥500	PASS
11	2462	16.33	≥500	PASS

B. Test Plots:



(Channel 1, 2412MHz, 802.11g)



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(Channel 6, 2437MHz, 802.11g)



(Channel 11, 2462MHz, 802.11g)

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2.3.3.3 802.11n-20 Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.98	≥500	PASS
6	2437	17.07	≥500	PASS
11	2462	17.06	≥500	PASS

B. Test Plots:



(Channel 1, 2412MHz, 802.11n-20)



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(Channel 6, 2437MHz, 802.11n-20)



(Channel 11, 2462MHz, 802.11n-20)

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2.4. Conducted Spurious Emissions and Band Edge

2.4.1. Requirement

According to FCC section 15.247(c), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.4.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

KDB 558074 Section 11.0 was used in order to prove compliance.

B. Equipments List:

Please refer ANNEX A(1.5).





2.4.3. Test Result

2.4.3.1 802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Manaurad Max. Out of	Limi		
		Read Emission (dPm)	Carrier	Calculated	Verdict
		Danu Emission (ubm)	Level	-20dBc Limit	
1	2412	-51.02	3.40	-16.60	PASS
6	2437	-52.44	4.79	-15.21	PASS
11	2462	-51.97	4.05	-15.95	PASS

B. Test Plots:

Note: The power of the Module transmitting frequency should be ignored.

Agilent Spectr	um Analyzer - Swept	t SA					
Marker 2	RF 50 Ω		SENSE:INT	Avg Type:	LIGNAUTO 0 Log-Pwr	1:13:22 PM Mar 05, 2018 TRACE 1 2 3 4 5 6	Peak Search
		PNO: Fast G IFGain:Low	Trig: Free Run Atten: 10 dB	Avg Hold:>	10/10	TYPE MWWWWW DET PNNNNN	NextBook
10 dB/div	Ref Offset 11.5 Ref 10.00 dE	dB 3m			Mkr2	24.039 GHz -51.024 dBm	NextPeak
-10.0	Ŷ1						Next Pk Right
-30.0 -40.0 -50.0						2 ⁻	Next Pk Left
-60.0 -70.0	and have been and		Alamate Market	الجميد المجال المالي مسروطان ا	-	~~~~	Marker Delta
Start 30 M #Res BW	/IHz 100 kHz	#VBV	V 300 kHz	FUNCTION FUNC	Sweep 2.3	Stop 25.00 GHz 386 s (2001 pts)	Mkr→CF
1 N 1 2 N 1 3 4 5 6	f f	2.415 GHz 24.039 GHz	3.402 dBm -51.024 dBm				Mkr→RefLvl
7 8 9 10 11						~	More 1 of 2
MSG					STATUS		

(Channel = 1, 30MHz to 25GHz)









(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)



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Agilent Spectrum Analyzer - Swept SA				
🗴 RF 50 Ω AC Marker 2 23.976230000000	PNO: Fast	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>10/10	01:11:52 PM Mar 05, 2018 TRACE 12 3 4 5 6 TYPE M	Peak Search
Ref Offset 11.5 dB	IFGain:Low Atten: 10 dB	М	kr2 23.976 GHz -51.965 dBm	Next Peak
Log V1				Next Pk Right
			2 ²	Next Pk Left
-60.0 -70.0 -80.0	And the second state of th	al y and de the group of the first of the standing	www.merenand.wv	Marker Delta
Start 30 MHz #Res BW 100 KHz	#VBW 300 kHz	Sweep	Stop 25.00 GHz 2.386 s (2001 pts) FUNCTION VALUE	Mkr→CF
2 N 1 f 23. 3 4	976 GHz -51.965 dBm			Mkr→RefLvl
7 8 9 10 11			v	More 1 of 2
MSG		STATU	s	

(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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2.4.3.2 802.11g Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Moasured Max, Out of	Limit		
		Rend Emission (dPm)	Carrier	Calculated	Verdict
		Danu Emission (uDm)	Level	-20dBc Limit	
1	2412	-52.92	0.89	-19.11	PASS
6	2437	-51.58	0.37	-19.63	PASS
11	2462	-52.77	-0.03	-20.03	PASS

B. Test Plots:

Note: The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)



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(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)

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Agilent Spectr	rum Analyzer - Swe	ept SA					
Marker 2	RF 50 Ω 24.0386550	AC 000000 GHz	SENSE:II	Avg Avg	ALIGN AUTO Type: Log-Pwr Hold:>10/10	01:15:51 PM Mar 05, 2018 TRACE 1 2 3 4 5 (TYPE MUMANAN	Peak Search
		PNO: Fast IFGain:Low	Atten: 10 dB		M	DET P NN NN 1	NextPeak
10 dB/div	Ref Offset 11. Ref 10.00 c	.5 dB JBm				-52.766 dBm	
0.00	1 						Next Pk Right
-20.0							
-30.0						2	Next Pk Left
-50.0					وروا و المراجع ا	-	
-70.0 -80.0	and and an and an	Laineriania Literature (Lordenne grant 14.	and with a statement of the statement	the second second second			Marker Delta
Start 30 M	VIHz					Stop 25.00 GHz	
#Res BW	100 kHz	#V	3W 300 kHz		Sweep	2.386 s (2001 pts)	Mkr→CF
MKR MODE T	RC SCL	× 2.465 GHz	√ -0.030 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
3 4		24.039 GHZ	-02.700 UBIII				Mkr→RefLvl
5 6 7							
8							More
11			IIII			~	1012
MSG					STATUS	5	

(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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2.4.3.3 802.11n -20MHz Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Moasured Max, Out of	Limit		
		Rend Emission (dPm)	Carrier	Calculated	Verdict
		Danu Emission (uDm)	Level	-20dBc Limit	
1	2412	-53.13	0.58	-19.42	PASS
6	2437	-53.17	0.60	-19.40	PASS
11	2462	-53.04	0.79	-19.21	PASS

B. Test Plots:

Note: The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)







(Band Edge, Channel = 1)



(Channel = 6, 30MHz to 25GHz)

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Agilent Spectrum Analyzer - Swept SA				
Marker 2 24.675390000000 GHz PN0: Fa	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>10/10	01:19:29 PM Mar 05, 2018 TRACE 123456 TYPE M	Peak Search
Ref Offset 11.5 dB 10 dB/div Ref 10.00 dBm	ow Atten: 10 dB	М	kr2 24.675 GHz -53.036 dBm	Next Peak
Log 0.00 -10.0 -20.0				Next Pk Right
-30.0				Next Pk Left
-60.0 -70.0	مان المراجع ال المراجع المراجع	بر می اینداز این اینداز اینداز اینداز اینداز اینداز اینداز این اینداز این اینداز این اینداز این اینداز این این این این این این این این این این این این		Marker Delta
Start 30 MHz #Res BW 100 kHz # MKR MODE TRC SCL × 4 N 4 5 2465 CH	VBW 300 kHz	Sweep	Stop 25.00 GHz 2.386 s (2001 pts)	Mkr→CF
2 N 1 f 24.675 GH 3 4 5 6 6 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7	z -53.036 dBm			Mkr→RefLvl
7 8 9 10 11				More 1 of 2
MSG		STATU	5	

(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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2.5. Power spectral density (PSD)

2.5.1. Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.5.2. Test Description

A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

- a) Set analyzer center frequency to channel center frequency.
- b) Set the span to 1.5 times DTS
- c) Set the RBW to 3 kHz
- d) Set the VBW to 10 kHz
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

B. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

KDB 558074 Section 10.2 was used in order to prove compliance.

C. Equipments List:

Please refer ANNEX A(1.5).





2.5.3. Test Result

2.5.3.1 802.11b Test mode

A. Test Verdict:

Spectral power density (dBm/3kHz)								
Channel	Frequency	Measured PSD (dBm/3kHz)	Limit	Verdict				
	(MHZ)		(abm/3kHz)					
1	2412	-9.70	8	PASS				
6	2437	-9.26	8	PASS				
11	2462	-8.69	8	PASS				
Measurement	Measurement uncertainty: ±1.3dB							

B. Test Plots:



(Channel = 1, 802.11b)



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(Channel = 6, 802.11b)



(Channel = 11, 802.11b)

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2.5.3.2 802.11g Test mode

A. Test Verdict:

	Spectral power density (dBm/3kHz)											
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict								
1	2412	-10.54	8	PASS								
6	2437	-10.14	8	PASS								
11 2462 -10.29 8 PASS												
Measurement u	uncertainty: ±1.3dl	В										

B. Test Plots:



(Channel = 1, 802.11g)



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(Channel = 6, 802.11g)



(Channel = 11, 802.11g)

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2.5.3.3 802.11n-20MHz Test mode

A. Test Verdict:

	Spe	ectral power density (dBm/3kHz)								
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict						
1	2412	-10.94	8	PASS						
6	2437	-10.91	8	PASS						
11 2462 -10.04 8 PASS										
Measurement u	uncertainty: ±1.3dl	В								

B. Test Plots:



(Channel = 1, 802.11n-20MHz)



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(Channel = 6, 802.11n-20MHz)



(Channel = 11, 802.11n-20MHz)

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2.6. Restricted Frequency Bands

2.6.1. Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.6.2. Test Description

A. Test Setup



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

KDB 558074 Section 12.1 was used in order to prove compliance.



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B. Equipments List:

Please refer ANNEX A(1.5).

2.6.3. Test Result

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below: E $[dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; A_T = L_{Cable loss} [dB] - G_{preamp} [dB]$ A_T : Total correction Factor except Antenna U_R : Receiver Reading G_{preamp} : Preamplifier Gain A_{Factor} : Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

2.6.3.1 802.11b Test mode

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	Α _τ	A _{Factor}	Max. Emission	Limit	Verdict
	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	Vordiet
1	2388.70	PK	48.39	-33.63	32.56	47.32	74	Pass
1	2387.92	AV	36.48	-33.63	32.56	35.41	54	Pass
11	2485.91	PK	48.91	-33.18	32.50	48.23	74	Pass
11	2484.62	AV	36.76	-33.18	32.50	36.08	54	Pass





B. Test Plots:

Keysight Spectrum Analyzer - Swept SA 01:48:31 PM Mar 06, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P N N N N RI Avg Type: Voltage Avg|Hold:>100/100 Marker Marker 1 2.388704000000 GHz Trig: Free Run Atten: 6 dB PNO: Fast DET Select Marker Mkr1 2.388 70 GHz 48.394 dBµ\ 10 dB/div Log Ref 100.00 dBµV Normal 12 Delta **Fixed** Stop 2.41200 GHz Sweep 1.000 ms (1001 pts) Start 2.30000 GHz Res BW (CISPR) 1 MHz #VBW 3.0 MHz Off FUNCTION FUNCTION WIDTH N VALUE N 1 f N 1 f 2.388 70 GHz 2.390 00 GHz 48.394 dBµV 47.675 dBµV **Properties** More 1 of 2

(Channel = 1 PEAK, 802.11b)



(Channel = 1 AVG, 802.11b)

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					Mo

(Channel = 11 PEAK, 802.11b)



(Channel = 11 AVG, 802.11b)



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2.6.3.2 802.11g Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Vordiat
Channel	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	verdict
1	2387.42	PK	48.39	-33.63	32.56	47.32	74	Pass
1	2388.32	AV	36.71	-33.63	32.56	35.64	54	Pass
11	2484.07	PK	51.34	-33.18	32.50	50.66	74	Pass
11	2483.91	AV	37.59	-33.18	32.50	36.91	54	Pass

B. Test Plots:



(Channel = 1 PEAK, 802.11g)



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(Channel = 1 AVG, 802.11g)



(Channel = 11 PEAK, 802.11g)

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(Channel = 11 AVG, 802.11g)

2.6.3.3 802.11n-20MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U⊳	A _T (dB)	A _{Factor} (dB@3m)	Max. Emission F	Limit (dBuV/m)	Verdict
	()	PK/ AV	(dBuV)	(42)		_ (dBµV/m)		
1	2388.54	PK	54.27	-33.63	32.56	53.2	74	Pass
1	2389.33	AV	37.86	-33.63	32.56	36.79	54	Pass
11	2484.23	PK	48.78	-33.18	32.50	48.10	74	Pass
11	2484.31	AV	34.57	-33.18	32.50	33.89	54	Pass



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B. Test Plots:

Keysight Spectrum Analyzer - Swept SA ALIGN OFF Avg Type: Voltage Avg|Hold:>100/100 01:36:14 PM Mar 06, 2018 TRACE 12345 TYPE MWWWW DET P P N N N Marker Marker 1 2.388544000000 GHz Trig: Free Run Atten: 6 dB PNO: Fast IFGain:Low Select Marker Mkr1 2.388 54 GHz 54.270 dBµV Ref 100.00 dBµV 10 dB/div Log Normal 1 ∧2, ⊮ Delta **Fixed** Start 2.30000 GHz Res BW (CISPR) 1 MHz Stop 2.41200 GHz Sweep 1.000 ms (1001 pts) #VBW 3.0 MHz Off 2.388 54 GHz 2.390 00 GHz 54.270 dBuV 51.431 dBuV N Properties ► More 1 of 2

(Channel = 1 PEAK, 802.11n-20)



(Channel = 1 AVG, 802.11n-20)

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t 2.46200 GHz BW (CISPR) 1 I MODE TRC SCL N 1 f N 1 f	VHz 2.483 500 2.484 232	#VBW	Υ 49.291 dBμ\ 48.779 dBμ\	FUNCTION	FUNCTION WIDTH	FUNCTIO		Properti

(Channel = 11 PEAK, 802.11n-20)



(Channel = 11 AVG, 802.11n-20)



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2.7. Conducted Emission

2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μ H/50 Ω line impedance stabilization network (LISN).

Frequency range	Conducted Limit (dBµV)					
(MHz)	Quai-peak	Average				
0.15 - 0.50	66 to 56	56 to 46				
0.50 - 5	56	46				
5 - 30	60	50				

NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10 2013.

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B. Equipments List:

Please refer ANNEX A(1.5).

2.7.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

Note: The test voltage is AC 120V/60Hz.



B. Test Plots:



NO. Fre.	Emission Level (dBµV)		Limit (dBµV)	Power-line	Verdict	
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.31	38.72	33.54	59.84	49.84		PASS
2	0.57	42.04	39.67	56.00	46.00		PASS
3	0.89	32.09	24.98	56.00	46.00	Lino	PASS
4	2.79	34.86	28.95	56.00	46.00	LINE	PASS
5	10.47	29.25	19.48	60.00	50.00		PASS
6	17.18	31.17	21.22	60.00	50.00		PASS



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(N Phase)

NO. Fre.		Emission Level (dBµV)		Limit (dBµV)	Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.26	38.91	33.04	61.59	51.59		PASS
2	0.46	33.58	27.69	56.61	46.61		PASS
3	2.22	36.64	30.76	56.00	46.00	Noutrol	PASS
4	10.47	30.17	18.78	60.00	50.00	neutrai	PASS
5	17.01	30.57	20.79	60.00	50.00		PASS
6	28.96	33.64	23.09	60.00	50.00		PASS







2.8. Radiated Emission

2.8.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
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

Note:

- For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)





2.8.2. Test Description

A. Test Setup:

1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz





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3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz. Test site have a minimum area of the ground plane covered with RF absorbing material as specified in Figure 6 of ANSI C63.4: 2014.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10

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.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of



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the site as factors are calculated to correct the reading

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test 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 test antenna elevation shall be that which maximizes the emissions. The test 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. The emission levels at both horizontal and vertical polarizations should be tested.

A. Equipments List:

Please refer ANNEX A(1.5).

2.8.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

 $E [dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; A_T = L_{Cable loss} [dB] - G_{preamp} [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.





2.8.3.1 802.11b Test mode

Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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2.8.3.2 802.11g Test mode

Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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2.8.3.3 802.11n-20MHz Test mode

Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Peak Output Power	±2.22dB
Power spectral density (PSD)	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77 dB
Restricted Frequency Bands	±5%
Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2



SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.				
Department:	Morlab Laboratory				
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang				
	Road, Block 67, BaoAn District, ShenZhen, GuangDong				
	Province, P. R. China				
Responsible Test Lab	Mr. Su Fond				
Manager:	IVII. Su Felig				
Telephone:	+86 755 36698555				
Facsimile:	+86 755 36698525				

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang
	Road, Block 67, BaoAn District, ShenZhen, GuangDong
	Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192.





4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Power Splitter	NW521	1506A	Weinschel	2017.05.24	2018.05.23
Attenuator 1	(N/A.)	10dB	Resnet	2017.05.24	2018.05.23
Attenuator 2	(N/A.)	3dB	Resnet	2017.05.24	2018.05.23
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2017.12.03	2018.12.02
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2017.05.24	2018.05.23
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2017.07.13	2018.07.12
LISN	812744	NSLK 8127	Schwarzbeck	2017.05.17	2018.05.16
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2017.05.17	2018.05.16
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3Auxiliary Test Equipment

Equipment Name	Model No.	Brand Name	Manufacturer	Cal.Date	Cal.Due Date
Computer	T430i	Think Pad	Lenovo	N/A	N/A





4.4 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal.Due Date
Receiver	MY54130016	N9038A	Agilent	2017.05.17	2018.05.16
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2017.05.14	2018.05.13
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2017.09.13	2018.09.12
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable(N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

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