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Verified code: 662644

Test Report

Report No.: E20221227602901-3

Customer:	Lumi United Technology Co., Ltd	
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residen Nanshan District, Shenzhen, China	ntial District,
Sample Name:	Camera Hub G3	
Sample Model:	СН-Н03	
Receive Sample Test Date:	Jan.05,2023	
Test Date:	Jan.12,2023 ~ Jan.12,2023	
Reference Document:	CFR 47 FCC Part 15 Subpart C RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators §15.247 Radiated spurious emissions	
Test Result:	Pass	

Prepared by: Wan Wanter Reviewed by: Un Unoting

Approved by: Zhao Zethan

GRG METROLOGY & TEST GROUP CO., LTD

Issued Date: 2023-04-14

GRG METROLOGY & TEST GROUP CO., LTD.

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5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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REPORT ISSUED HISTORY

Report Version Report No.		Description	Compile Date
1.0	E20221227602901-3	Original Issue	2023-03-13

The applicant declared that the model CH-H03 comparison before and after the change as below: The 802.11n HT40 mode of the 2.4G Wi-Fi module has been deleted for this model, as well as other modification information in the following table. There are corresponding changes to the circuit schematic and PCB layout, but this will not affect the RF performance test results. For details, see the following table:

The Original model		The New model	
Change 1. Parameter before change	Bit number C160 is vacant	Parameter after Change	Add C160 capacitor, capacity : 12pF
Change 2. Add components	1.R97 location as shown below2.R17, C158, and C159 are empty as shown below3.R34 is another name on the motherboard, under the camera	Parameter after Change	1.Move bit number R97 position 2.Move bit number R34 position 3.Add resistor R17=120R, capacitor C158=27pF, C159=27pF
Change 3. Change component parameters (Change pcba: usb small version)	bit number: L1 (resistor) Parameter: 0R (usb small version)	Parameter after Change	bit number: L1 (magnetic bead) Parameter: magnetic bead value: 100MHz@120ohm magnetic beads (usb small version)
Change 4. Parameter before change (U1 added one replacement suppliers)	bit number: U1 parameter: 2.8V~30V\1MHz\2A\0.6mA\SOT23-6 SILERGY SY7200AABC	Parameter after Change	bit number: U1 A:parameter: 2.8V~30V\1MHz\2A\0.6mA\SOT23-6 SILERGY SY7200AABC B: parameter: 2.7~6V\60mA\0.8MHz\1A\SOT23-6 ETA ETA1617S2G

Change 5. Parameter before change	Bit number U6 is FORESEE/FS35ND02G-S3Y2QWFI000	Parameter after Change	Bit number U6 is 1.ESMT/F50L2G41XA -104YG2B or 2.Winbond/W25N02KVZEIR
Change 6. Add components	Bit number U19 is HDSC/HC32F005C6UA	Parameter after Change	Bit number U19 is Cmsemicon/CMS32L031QN20
Change 7. Change component parameters (Change pcba: usb small version)	1.Bit number U18 is SmartSens/SC3335 2.Bit number U12 is 1.2V LDO	Parameter after Change	1.Bit number U18 is SmartSens/SC3338 2.Bit number U12 is vacant
Change 8. Software Version	3.2.8_0003.0004	Parameter after Change	V3.5.2_0010.0004

Note: According to the difference declared letter by applicant, after evaluated only the Radiated Spurious Emission 30MHz to 1GHz test data need tested and revised, all other test data please refer to the report E20210426746801-10 issue on 2021-09-04.

1. TEST RESULT SUMMARY

Technical Requirements						
CFR 47 FCC Part 15 Subpart C (§15.247)						
Limit / Severity	Result					
§15.209	Radiated spurious emissions	Pass				

2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.2 MANUFACTURER

Name:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment:	Camera Hub G3
Model No.: Adding Model:	СН-Н03
Trade Name:	Aqara
FCC ID:	2AKIT-CHH03
Power Supply: Adapter	DC5V power supplied by adapter Model:A8A-050200U-US1
Specification: Frequency Range:	Input:100-240V~ 50/60Hz 0.35A Output:5.0V 2.0A 2405MHz-2475MHz
Transmit Power:	7.58dBm
Modulation type:	OQPSK
Antenna Specification: Temperature Range:	Internal antenna 2dBi gain (Max.) -10℃~40℃
Hardware Version:	A20-GHC01-MIAN-X4
Software Version:	V3.5.2_0010.0004
Sample No: Note:	E20221227602901-0002

2.4 CHANNEL LIST

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
11	2405	12	2410	13	2415	14	2420
15	2425	16	2430	17	2435	18	2440
19	2445	20	2450	21	2455	22	2460
23	2465	24	2470	25	2475		/

2.5 TEST OPERATION MODE

Test Item	Mode No.	Description of the modes
Radiated Emission	1	Zigbee fixed frequency transmitting

2.6 LOCAL SUPPORTIVE

Name of Equipment	Manufacturer	Model	Serial Number	Note
Notebook	LENOVO	TianYi 310-14ISK	MP18DLC6	1
Serial board	1	/	/	<u>i</u>

No.	Cable Type	Qty.	Shielded Type	Ferrite Core(Qty.)	Length
1	DC Cable	1	No	0	1.0m
2	USB Cable	1.0	No	0	1.5m

2.7 CONFIGURATION OF SYSTEM UNDER TEST



Test software:

Software version	Test level
QCOM_V1.0	80

3. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

Add	Address: No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhu District Shenzhen, 518110, People's Republic of China	Ja
P.C.	: 518110	
Tel	: 0755-61180008	
Fax	: 0755-61180008	

4. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025:2017.

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

CanadaISED (Company Number: 24897, CAB identifier:CN0069)USAFCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site, <u>http://www.grgtest.com</u>

5. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty	
	Havingantal	30MHz~200MHz	4.5dB ¹⁾	
De diste d Enviroien	Horizontal	200MHz~1000MHz	4.4dB ¹⁾	
Radiated Emission		30MHz~200MHz	4.4dB ¹⁾	
	Vertical	200MHz~1000MHz	4.5dB ¹⁾	

Measurement	Uncertainty
RF frequency	6.0×10 ⁻⁶
Humidity	6%
Temperature	2°C

Note: ¹⁾ This uncertainty represents an expanded uncertainty expressed at approximately the 95%. This uncertainty represents an expanded uncertainty factor of k=2.

6. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due	
Radiated Spurious Emission(30MHz-1GHz)					
Test S/W	EZ	CCS-03A1	/	/	
Test Receiver	R&S	ESR7	102444	2023-09-02	
Preamplifier	EMEC	EM330	100426	2023-03-05	
Bi-log Antenna	TESEQ	CBL6143A	26039	2024-10-23	

Note: The calibration cycle of the above instruments is 12 months except for the Bi-log Antenna which is 24 months.

7. RADIATED SPURIOUS EMISSIONS

7.1 LIMITS

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Frequency (MHz)	Quasi-peak(µV/m)	Measurement distance(m)	Quasi-peak(dBµV/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30~88	100	3	40
88~216	150	3	43.5
216~960	200	3	46
Above 960	500	3	54

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) Above 18GHz test distance is 1m, so the Peak Limit= $74+20*\log(3/1)=83.54$ (dBµV/m). The Avg Limit= $54+20*\log(3/1)=63.54$ (dBµV/m).

7.2 TEST PROCEDURES

1) Sequence of testing 9kHz to 30MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground.

--- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

--- The EUT is placed on a desktop position in the center of the turntable.

- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Pre measurement:

- --- The turntable rotates from 0 ° to 360 °.
- --- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position (0 ° to 360 °) and by rotating the elevation axes (0 ° to 360 °).

--- The final measurement will be done in the position (turntable and elevation) causing the highest

emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

2) Sequence of testing 30MHz to 1GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

--- The EUT is placed on a desktop position in the center of the turntable.

- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Pre measurement:

- --- The turntable rotates from 0 ° to 360 °.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 $^{\circ}$ to 360 $^{\circ}$ and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1GHz to 18GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

- --- The EUT is placed on a desktop position in the center of the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0 ° to 360 °.

- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 4 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of pre measurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

--- The EUT is placed on a desktop position in the center of the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Pre measurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

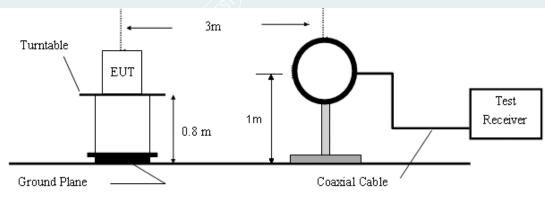
Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the pre measurements with Peak and Average detector. --- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

NOTE:

(a).The frequency from 9kHz to 150kHz, Set RBW=300Hz(for Peak&AVG), RBW=300Hz(for Peak&AVG).
the frequency from 150kHz to 30MHz, Set RBW=9kHz, RBW=9kHz, (for QP Detector).
(b).The frequency from 30MHz to 1GHz, Set RBW=120kHz, RBW=300kHz, (for QP Detector).

7.3 TEST SETUP





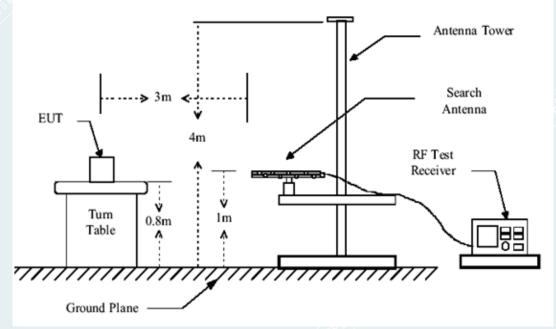
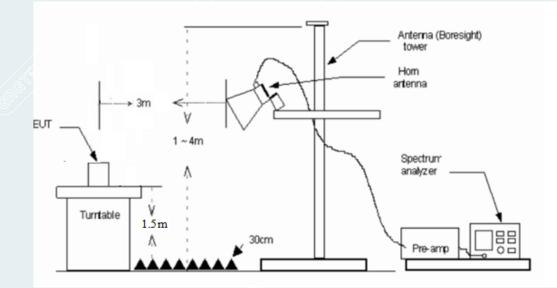
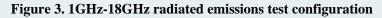


Figure 2. 30MHz to 1GHz radiated emissions test configuration





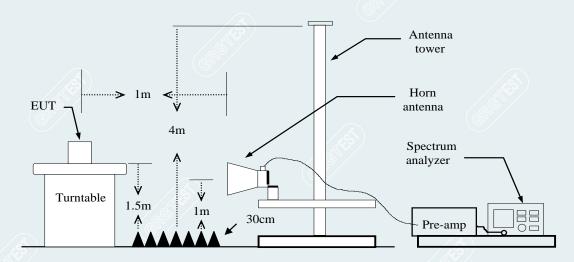


Figure 4. 18GHz-26.5GHz radiated emissions test configuration

7.4 DATA SAMPLE

30MHz to 1GHz

No.	Frequency	Reading	Factor	Result	Limit	Margin	Remark	Pole
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		
XXX	XXX	37.06	-15.48	21.58	40.00	-18.42	QP	Vertical

1GHz to 18GHz

No.	Frequency	Reading	Remark	Pole				
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		
XXX	XXX	65.45	-11.12	54.33	74.00	-19.67	Peak	Vertical
XXX	XXX	63.00	-11.12	51.88	54.00	-2.12	AVG	Vertical

Above 18GHz

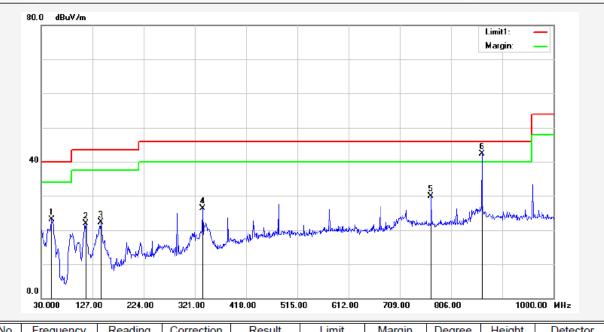
No.	Frequency	Reading	Factor	Level	Limit	Margin	Remark	Pole
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)		
XXX	XXX	68.86	57.66	-11.20	83.54	25.88	peak	Vertical
XXX	XXX	68.89	-11.20	57.69	63.54	5.85	AVG	Vertical

Frequency (MHz)	= Emission frequency in MHz	
Ant.Pol. (H/V)	= Antenna polarization	
Reading (dBuV)	= Uncorrected Analyzer / Receiver reading	
Factor (dB)	= Antenna factor + Cable loss – Amplifier gain	
Result (dBuV/m)	= Reading (dBuV) + Correction Factor (dB/m)	
Limit (dBuV/m)	= Limit stated in standard	
Margin (dB)	= Remark Result (dBuV/m) – Limit (dBuV/m)	
Peak	= Peak Reading	
QP	= Quasi-peak Reading	
AVG	= Average Reading	

7.5 TEST RESULTS

Below 1GHz

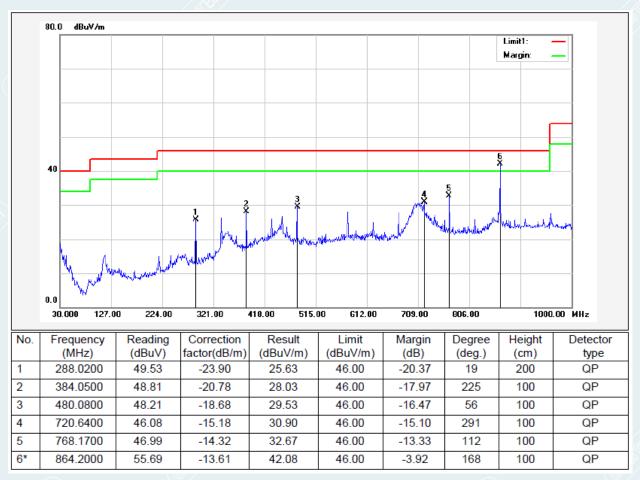
EUT Name:	Camera Hub G3	Test Mode:	Mode 1
Model:	СН-Н03	Sample No:	E20221227602901-0002
Power supply:	AC 120V/60Hz	Environmental Conditions:	22.3°C/49%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-01-12
Channel	Lowest channel (2405MHz)	Polarity:	Vertical



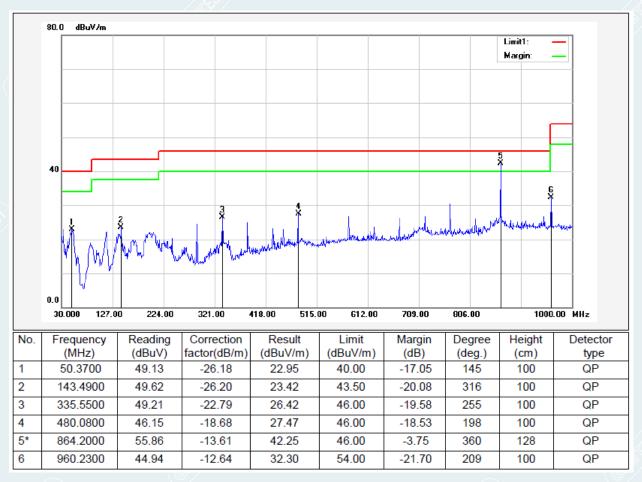
No.	Frequency	Reading	Correction	Result	Limit	Margin	Degree	Height	Detector
	(MHz)	(dBuV)	factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(deg.)	(cm)	type
1	49.4000	48.81	-25.80	23.01	40.00	-16.99	36	100	QP
2	114.3900	48.55	-26.70	21.85	43.50	-21.65	85	100	QP
3	143.4900	48.51	-26.20	22.31	43.50	-21.19	46	100	QP
4	335.5500	49.06	-22.79	26.27	46.00	-19.73	241	100	QP
5	768.1700	44.16	-14.32	29.84	46.00	-16.16	260	100	QP
6*	864.2000	56.01	-13.61	42.40	46.00	-3.60	185	100	QP

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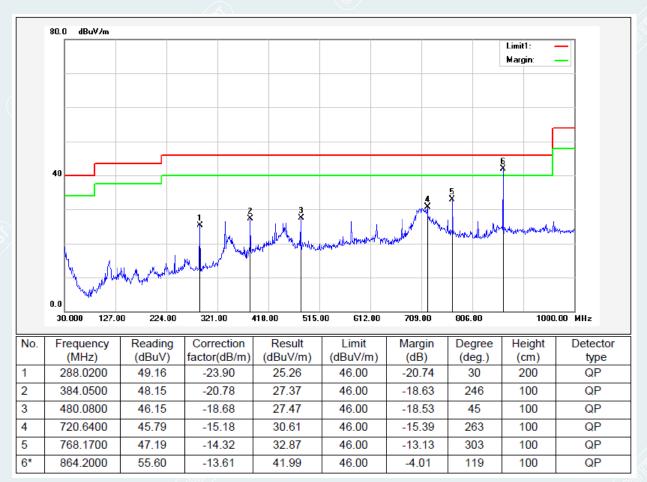
EUT Name:	Camera Hub G3	Test Mode:	Mode 1	
Model:	CH-H03	Sample No:	E20221227602901-0002	
Power supply:	AC 120V/60Hz	Environmental Conditions:	22.3°C/49%RH/101.0kPa	
Test Engineer:	Huang Xinlong	Test Date:	2023-01-12	
Channel	Lowest channel (2405MHz)	Polarity:	Horizontal	



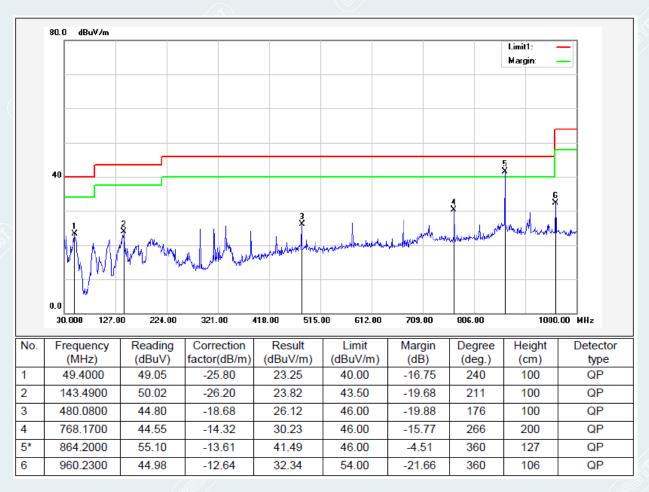
EUT Name:	Camera Hub G3	Test Mode:	Mode 1	
LOT Name.		Test Widde.		
Model:	СН-Н03	Sample No:	E20221227602901-0002	
Power supply:	AC 120V/60Hz	Environmental Conditions:	22.3°C/49%RH/101.0kPa	
Test Engineer:	Huang Xinlong	Test Date:	2023-01-12	
Channel	Lowest channel (2440MHz)	Polarity:	Vertical	



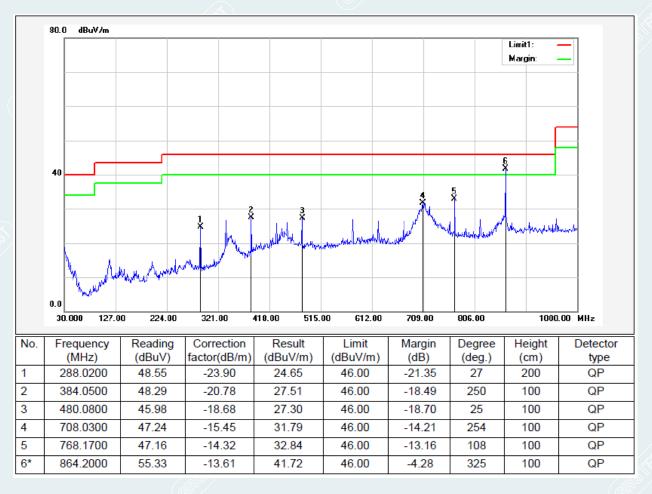
EUT Name:	Camera Hub G3	Test Mode:	Mode 1
Model:	СН-Н03	Sample No:	E20221227602901-0002
Power supply:	AC 120V/60Hz	Environmental Conditions:	22.3°C/49%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-01-12
Channel	Lowest channel (2440MHz)	Polarity:	Horizontal



EUT Name:	Camera Hub G3	Test Mode:	Mode 1
Model:	СН-Н03	Sample No:	E20221227602901-0002
Power supply:	AC 120V/60Hz	Environmental Conditions:	22.3°C/49%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-01-12
Channel	Lowest channel (2475MHz)	Polarity:	Vertical



EUT Name:	Camera Hub G3	Test Mode:	Mode 1
Model:	СН-Н03	Sample No:	E20221227602901-0002
Power supply:	AC 120V/60Hz	Environmental Conditions:	22.3°C/49%RH/101.0kPa
Test Engineer:	Huang Xinlong	Test Date:	2023-01-12
Channel	Lowest channel (2475MHz)	Polarity:	Horizontal



Remark:

- Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument
- ¹ Susing Quasi-peak detector mode.
- 2 Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 3 The IF bandwidth of Receiver between 30MHz to 1GHz was 120 kHz.

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM

Please refer to the attached document E20221227602901-18-Test photo-FCC+IC.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E20221227602901-17 EUT Photo-FCC+IC.

----- End of Report -----