

FCC RADIO TEST REPORT

FCC ID: 2AA8W-OCAMS1

Applicant : Ahoku Electronic Company
Address : 5F, No.88, Sec.1 Nei-Hu Road, Taipei, Taiwan, R.O.C.

Equipment under Test (EUT):

Name : IP cam
Model : OCamS1, OCamS2, OCamS3, OcamS4, OcamS5
Trademark : OCam
Standards : FCC PART 15, SUBPART C : 2014 (Section 15.247)
Report No. : CTB151113002Q
Date of Test : November 17-25, 2015
Date of Issue : November 26, 2015

Test Result :	PASS *
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In the configuration tested, the EUT complied with the standards specified above

Authorized Signature



(Simon Lee)
General Manager

The manufacture should ensure that all the products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of Shenzhen CTB Testing Technology Co., Ltd. Or test done by Shenzhen CTB Testing Technology Co., Ltd. Approvals in connection with, distribution or use of the product described in this report must be approved by Shenzhen CTB Testing Technology Co., Ltd Approvals in writing.

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1 General Information

1.1 Description of Device (EUT)

EUT : IP cam

Model No. : OCamS1, OCamS2, OCamS3, OcamS4, OcamS5

DIFF. : All model's the function, software and electric circuit are the same. so all the test were performed on the model OCamS1.

Trade mark : OCam

Power supply : DC 5V from adapter with AC 120V/60Hz adapter

Radio Technology : IEEE 802.11b, g, n/HT20, n/HT40,

Operation frequency : IEEE 802.11b: 2412MHz-2462MHz
IEEE 802.11g: 2412MHz-2462MHz
IEEE 802.11n HT20: 2412-2462MHz,
IEEE 802.11n HT40:2422-2452MHz

Modulation : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK),
IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK),
IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK),

Antenna Type : PIFA Antenna, max gain 1.0 dBi

Applicant : Ahoku Electronic Company
Address : 5F,No.88,Sec.1 Nei-Hu Road, Taipei, Taiwan, R.O.C.

Manufacturer : IPS Technology com
Address : 7 Floor,E block,Dong Hai Wang Building,BuLong Road,LongGang District,Shenzhen,P.R.C

1.2 Description of Test Facility

Shenzhen CTB Testing Technology Co., Ltd.

10th floor, West Logistics Information Center Building, Fuyong Town , Bao'an District, Shenzhen City, P.R.C

FCC Registered No.: 671575

2 EMC Equipment List

Equipment	Manufacture	Model No.	Serial No.	Cal. Due day	Cal Interval
3m Semi-Anechoic Chamber	Frankonia	N/A	N/A	2016.04.09	1Year
EMI Test receiver	Rohde&Schwarz	ESCS30	100085	2016.04.09	1Year
Signal Analyzer	Agilent	N9010A	MY48030494	2016.08.15	1 Year
Bilog Antenna	SCHAFFNER CHASE	CBL6143	N/A	2016.04.09	1Year
Horn Antenna	SCHAFFNER CHASE	BBHA 9120D	BBHA 9120 D(1206)	2016.04.09	1Year
Amplifier	EM	EM-30180	060568	2016.04.09	1Year
Power Meter	Anritsu	ML2487A	6K00001491	2016.08.15	1Year
Power sensor	Anritsu	ML2491A	32516	2016.08.15	1Year
Coaxial Cable	SZHTW	N/A	C-01	2016.04.09	1Year
Coaxial Cable	SZHTW	N/A	C-02	2016.04.09	1Year
Coaxial Cable	SZHTW	N/A	C-03	2016.04.09	1Year
Test Receiver	Rohde&Schwarz	ESCS30	100086	2016.04.09	1 Year
L.I.S.N.	Schwarzbeck	NSLK8126	8126466	2016.04.09	1 Year
50 Ω Coaxial Switch	Anritsu	MP59B	6200264326	2016.04.09	1 Year
10dB Attenuator	Schwarzbeck	9516F	9620	2016.04.09	1 Year

3 Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The test procedure used was ANSI Standard C63.4-2009 using a 50 u H LISN. Both Lines were observed. The bandwidth of the receiver was 10kHz with an appropriate sweep speed. The ambient temperature of the EUT was 25°C with a humidity of 58%.

RADIATION INTERFERENCE: The test procedure used was ANSI Standard C63.4-2009 using a ANRITSU spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a micro volt at the output of the antenna. The resolution bandwidth was 100kHz and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3MHz above 1 GHz. The ambient temperature of the EUT was 25°C with a humidity of 58%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer and cable loss. The antenna correction factors and cable loss are stated in terms of dB. The gain of the Pre-selector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF + CABLE = FS

33.20 dBuV + 10.36 dB + 0.9 dB= 44.46 dBuV/m @ 3m

ANSI STANDARD C63.4-2009 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation. When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSI Standard C63.4-2009 10.1.7 with the EUT 40 cm from the vertical ground wall.

4 Summary of Measurement

4.1 Summary of test result

Test Item	Test Requirement	Standards Paragraph	Result
Spurious Emission	FCC PART 15	Section 15.247&15.209	Compliance
Conduction Emission	FCC PART 15	Section 15.207	Compliance
Bandwidth Test	FCC PART 15	Section 15.247	Compliance
Peak Power	FCC PART 15	Section 15.247	Compliance
Power Density	FCC PART 15	Section 15.247	Compliance
Band Edge	FCC PART 15	Section 15.247	Compliance
Antenna Requirement	FCC PART 15	Section 15.203	Compliance

Note: The EUT has been tested as an independent unit. And Continual Transmitting in maximum power (The Notebook be used during Test)

EUT is configured to transmit continuously (Duty cycle) is 100%, average correction factor = $20 \log 1=0$

4.2 Test connection

Link Mode



4.3 Assistant equipment used for test

Description	:	AC/DC ADAPTOR
Manufacturer	:	IPS Technology com
Model No.	:	GDP12AV-0502000-UL
Input	:	AC 110-240V, 50/60Hz, 045A
Output	:	DC 5V/2A

4.4 Test mode

Tested mode, channel, and data rate information			
Mode	data rate (Mbps)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40	13.5	Low :CH1	2422
	13.5	Middle:CH4	2437
	13.5	High:CH7	2452

Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.

4.5 Channel list

For IEEE 802.11b/g and IEEE 802.11n/HT20					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		

For IEEE 802.11n/HT40					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2422	CH5	2442	/	
CH2	2427	CH6	2447	/	
CH3	2432	CH7	2452	/	
CH4	2437	/		/	

4.6 Test Conditions

Temperature range	21-25°C
Humidity range	40-75%
Pressure range	86-106kPa

4.7 Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	2.40dB	
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.15 dB	Polarize: V
	2.56dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.54dB	Polarize: V
	4.2dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	2.12dB	Polarize: H
	2.52dB	Polarize: V
Uncertainty for radio frequency	1×10 ⁻⁹	
Uncertainty for conducted RF Power	0.66dB	
Uncertainty for temperature	0.2°C	
Uncertainty for humidity	1%	
Uncertainty for DC and low frequency voltages	0.05%	

5 Spurious Emission

5.1 Radiation Emission

5.1.1 Radiation Emission Limits(15.209)

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (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

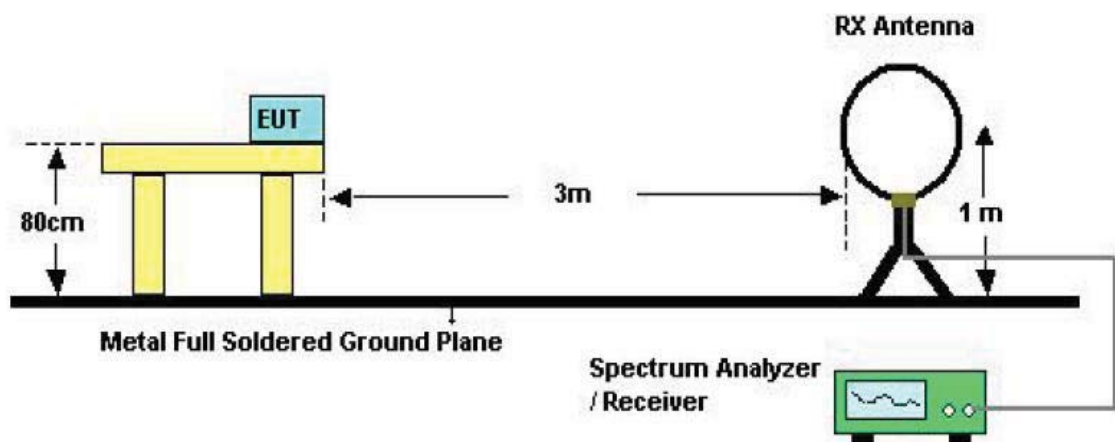
Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

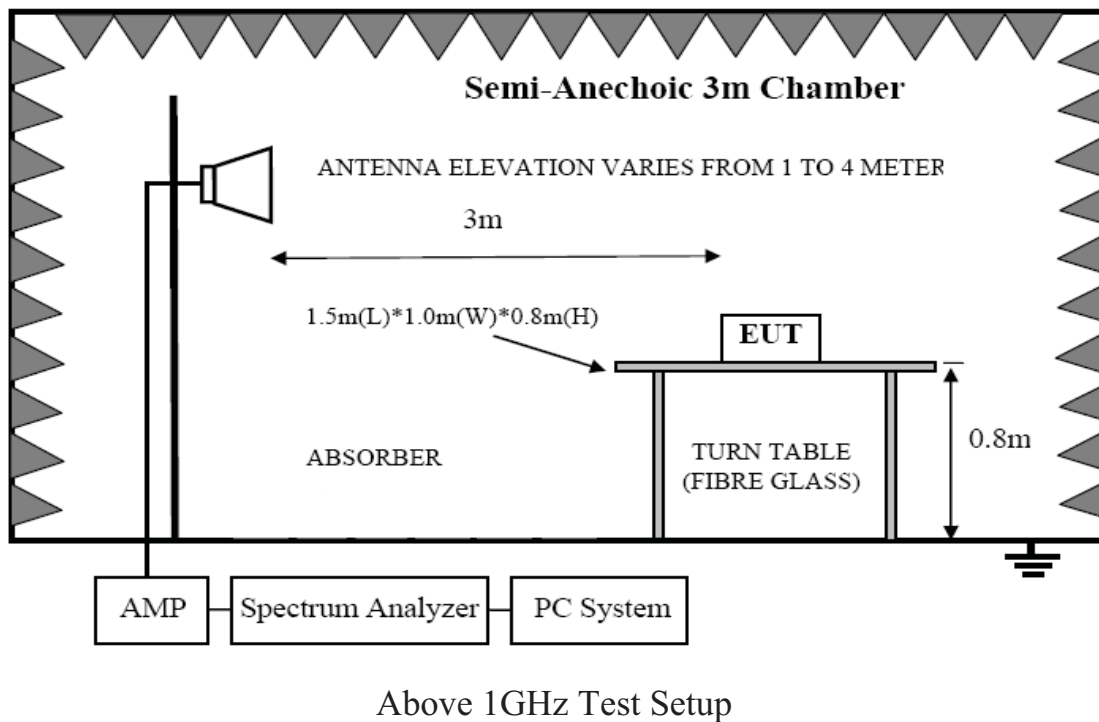
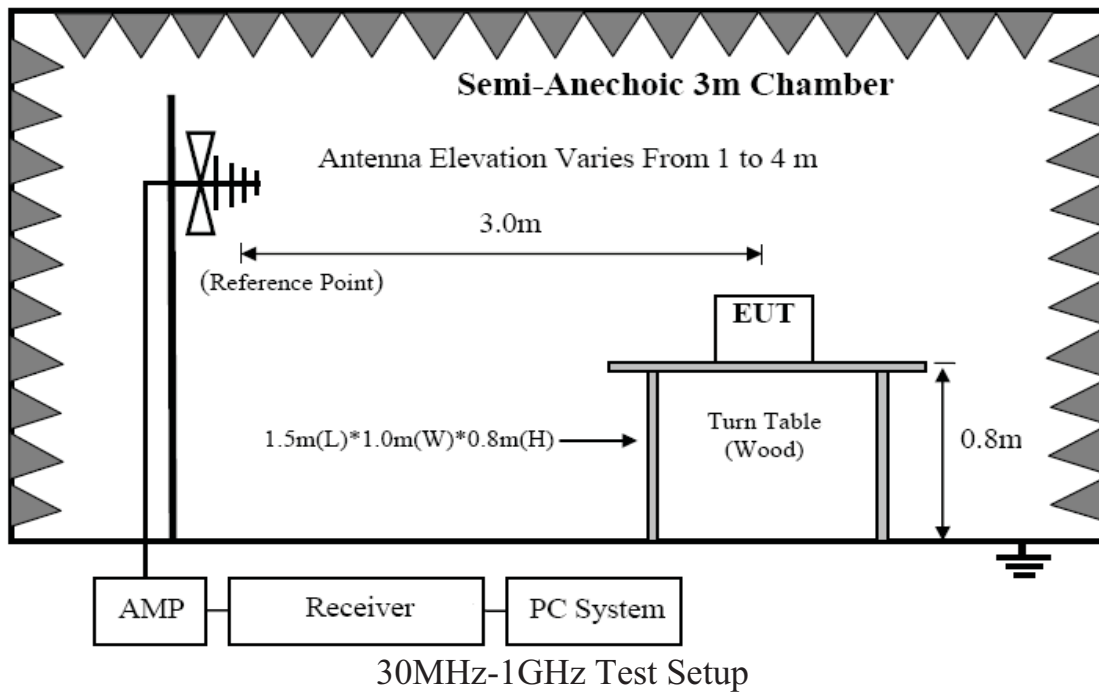
- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(Uv/m)

5.1.2 Test Setup

See the next page



Below 30MHz Test Setup



5.1.3 Test Procedure

- a) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground, The table was rotated 360 degrees to determine the position of the highest radiation
- b) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.
- c) 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 Qusia Peak Detector mode premeasured
- d) If Peak value comply with QP limit Below 1GHz. The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.
- e) For the actual test configuration, please see the test setup photo.

Note: 3 axes be tested in the radiated emission test , only the Z axes worst case was recorded in the test report

5.1.4 Test Equipment Setting For emission test Result

9KHz~150KHz	RBW 200Hz	VBW 1KHz
150KHz~30MHz	RBW 9KHz	VBW 30KHz
30MHz~1GHz	RBW 120KHz	VBW 300KHz
Above 1GHz	RBW 1MHz	VBW 3MHz

5.1.5 Test Condition

Continual Transmitting in maximum power.

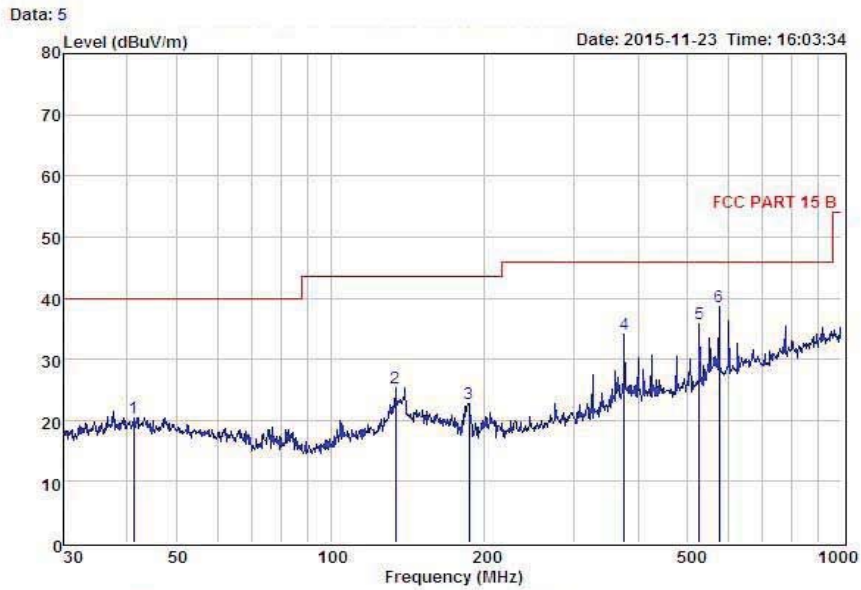
5.1.6 Test Result

We have scanned the 9KHz from 25GHz to the EUT.

Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

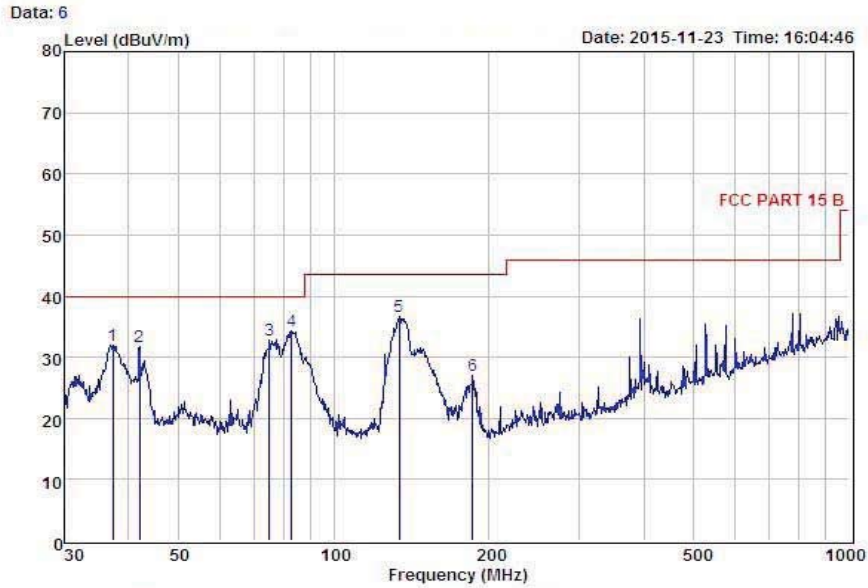
Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



Condition : FCC PART 15 B 3m POL: HORIZONTAL
 EUT :
 Model No :
 Test Mode :
 Power : DC 5V from adapter with AC 120V/60Hz
 Test Engineer :
 Remark :

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	41.13	37.13	13.93	30.85	0.18	20.39	40.00	-19.61	Peak
2	134.09	41.23	13.08	29.44	0.50	25.37	43.50	-18.13	Peak
3	186.44	40.28	10.95	28.96	0.57	22.84	43.50	-20.66	Peak
4	375.94	46.31	14.35	27.42	0.96	34.20	46.00	-11.80	Peak
5	526.40	45.14	16.99	27.22	1.00	35.91	46.00	-10.09	Peak
6	576.64	46.22	17.88	26.65	1.17	38.59	46.00	-7.41	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss



Condition : FCC PART 15 B 3m POL: VERTICAL
 EUT :
 Model No :
 Test Mode :
 Power : DC 5V from adapter with AC 120V/60Hz
 Test Engineer :
 Remark :

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	37.29	48.94	13.73	30.83	0.08	31.92	40.00	-8.08	Peak
2	42.01	48.08	13.93	30.40	0.19	31.80	40.00	-8.20	Peak
3	74.92	52.83	9.90	30.09	0.25	32.89	40.00	-7.11	Peak
4	82.94	54.69	9.35	30.02	0.23	34.25	40.00	-5.75	Peak
5	134.09	52.45	13.08	29.44	0.50	36.59	43.50	-6.91	Peak
6	185.79	44.58	10.95	28.98	0.57	27.12	43.50	-16.38	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

From 1G-25GHz : PASS

Remark: All modes have been tested, and only reported worst data of IEEE 802.11 b mode.

EUT	IP cam	Model Name	OCamS1
Temperature	24°C	Relative Humidity	54%
Pressure	960hPa	Test voltage	DC 5.0V From Adapter With AC 120V/60Hz
Test Mode	TX Low 2412MHz		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)			
4824	V	46.67	---	9.92	56.59	---	74.00	-17.41	Peak
4824	V	32.56	---	9.92	42.48	---	54.00	-11.52	AV
7236	V								
7236	V								
9648	V								
9648	V								
Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)			
4824	H	47.52	---	9.92	57.44	---	74.00	-16.56	Peak
4824	H	34.28	---	9.92	44.20	---	54.00	-9.80	AV
7236	H								
7236	H								
9648	H								
9648	H								

Notes:

1, Measuring frequency from 1GHz to 25GHz

2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK

3, Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: RMS

4, AV Means AV detector test data, Peak Means Peak detector test data.

Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	IP cam	Model Name	OCamS1
Temperature	24°C	Relative Humidity	54%
Pressure	960hPa	Test voltage	DC 5.0V From Adapter With AC 120V/60Hz
Test Mode	TX Mid 2437MHz		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)			
4874	V	45.83	---	9.96	55.79	---	74.00	-18.21	Peak
4874	V	32.17	---	9.96	42.13	---	54.00	-11.87	AV
7311	V								
7311	V								
9748	V								
9748	V								

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)			
4874	H	46.59	---	9.96	56.55	---	74.00	-17.45	Peak
4874	H	34.20	---	9.96	44.16	---	54.00	-9.84	AV
7311	H								
7311	H								
9748	H								
9748	H								

Notes:

1, Measuring frequency from 1GHz to 25GHz

2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK

3, Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: RMS

4, AV Means AV detector test data, Peak Means Peak detector test data.

Emissions attenuated more than 20 dB below the permissible value are not reported.

EUT	IP cam	Model Name	OCamS1
Temperature	24°C	Relative Humidity	54%
Pressure	960hPa	Test voltage	DC 5.0V From Adapter With AC 120V/60Hz
Test Mode	TX High 2462MHz		

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)			
4924	V	44.34	---	10.02	54.36	---	74.00	-19.64	Peak
4924	V	32.06	---	10.02	42.08	---	54.00	-11.92	AV
7386	V								
7386	V								
9848	V								
9848	V								
Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	Margin (dB)	Remark
					Peak (dBuV/m)	AV (dBuV/m)			
4924	H	45.18	---	10.02	55.20	---	74.00	-18.80	Peak
4924	H	33.38	---	10.02	43.40	---	54.00	-10.60	AV
7386	H								
7386	H								
9848	H								
9848	H								

Notes:

1, Measuring frequency from 1GHz to 25GHz

2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK

3, Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: RMS

4, AV Means AV detector test data, Peak Means Peak detector test data.

Emissions attenuated more than 20 dB below the permissible value are not reported.

6 POWER LINE CONDUCTED EMISSION

6.1 Conducted Emission Limits(15.207)

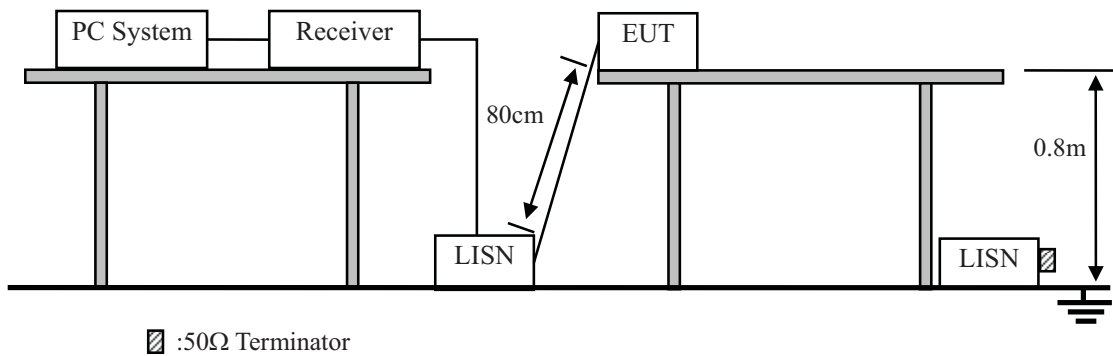
Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3. The limit decreases in line with the logarithm of the frequency in the rang of 0.15 to 0.50 MHz.

6.2 Test Setup



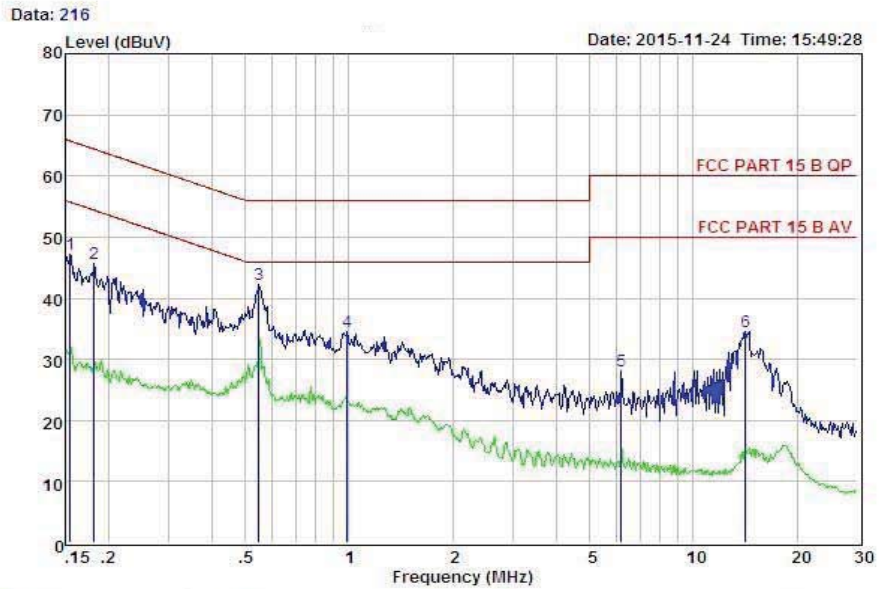
6.3 Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4-2009 on Conducted Emission Measurement. The bandwidth of test receiver (R & S ESCOCamS10) is set at 9 kHz.

6.4 Test Results

PASS

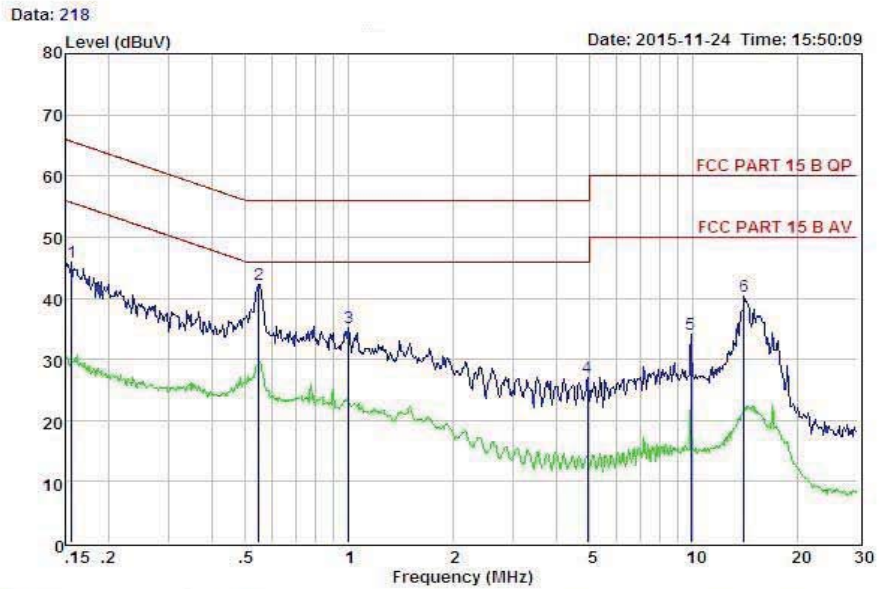
Detailed information please see the following page.



Condition : FCC PART 15 B QP POL: LINE
 EUT :
 Model No :
 Test Mode :
 Power : DC5 V from adapter with AC 120V/60Hz
 Test Engineer:
 Remark :

Item	Freq MHz	Read dBuV	LISN Factor dB	Attenuator Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.155	37.52	0.03	-9.52	0.10	47.17	65.74	-18.57	Peak
2	0.182	35.98	0.03	-9.52	0.10	45.63	64.42	-18.79	Peak
3	0.546	32.48	0.03	-9.58	0.10	42.19	56.00	-13.81	Peak
4	0.989	24.71	0.04	-9.63	0.10	34.48	56.00	-21.52	Peak
5	6.186	17.90	0.11	-9.97	0.14	28.12	60.00	-31.88	Peak
6	14.213	24.17	0.23	-9.87	0.23	34.50	60.00	-25.50	Peak

Remarks: Level = Read + LISN Factor - Attenuator Factor + Cable loss



Condition : FCC PART 15 B QP POL: NEUTRAL
 EUT :
 Model No :
 Test Mode :
 Power : DC5 V from adapter with AC 120V/60Hz
 Test Engineer:
 Remark :

Item	Freq MHz	Read dBuV	LISN Factor dB	Attenuator Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.156	36.34	0.03	-9.52	0.10	45.99	65.65	-19.66	Peak
2	0.546	32.63	0.03	-9.58	0.10	42.34	56.00	-13.66	Peak
3	1.000	25.33	0.04	-9.63	0.10	35.10	56.00	-20.90	Peak
4	4.926	16.90	0.10	-9.92	0.12	27.04	56.00	-28.96	Peak
5	9.861	23.77	0.18	-9.93	0.21	34.09	60.00	-25.91	Peak
6	14.063	30.10	0.23	-9.87	0.23	40.43	60.00	-19.57	Peak

Remarks: Level = Read + LISN Factor - Attenuator Factor + Cable loss

7 Conducted Maximum Output Power

7.1 Test limit

Please refer section 15.247.

Regulation 15.247(b) The limit of Maximum Output Power Measurement is 1W(30dBm)

7.2 Test Procedure

Details see the KDB558074 Meas Guidance V03r02

7.2.1 Place the EUT on the table and set it in transmitting mode.

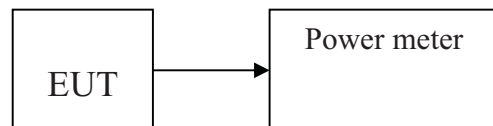
7.2.2 Connected the EUT's antenna port to peak power meter by 20dB attenuator.

7.2.3 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

Details see the KDB558074 DTS Meas Guidance V03r02

7.3 Test Setup



7.4 Test Results

PASS

Detailed information please see the following page.

EUT: IP cam		M/N: OCamS1		
Test date: 2015-11-20		Test site: RF site		Tested by: Mason
Mode	Frequency (MHz)	PK Output power (dBm)	Limit (dBm)	Margin (dB)
IEEE 802.11 b	CH1: 2412	9.38	30	20.62
	CH6: 2437	9.41	30	20.59
	CH11: 2462	9.32	30	20.68
IEEE 802.11 g	CH1: 2412	8.80	30	21.20
	CH6: 2437	8.93	30	21.07
	CH11: 2462	8.76	30	21.24
IEEE 802.11 n/HT20	CH1: 2412	8.40	30	21.60
	CH6: 2437	8.28	30	21.72
	CH11: 2462	8.31	30	21.69
IEEE 802.11 n/HT40	CH1: 2422	7.98	30	22.02
	CH4: 2437	7.88	30	22.12
	CH7: 2452	7.90	30	22.10
Conclusion: PASS				

8 PEAK POWER SPECTRAL DENSITY

8.1 Test limit

8.1.1 Please refer section 15.247.

8.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

8.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

8.2 Method of measurement

Details see the KDB558074 D01 DTS Meas Guidance v03r02.

8.2.1 Place the EUT on the table and set it in transmitting mode.

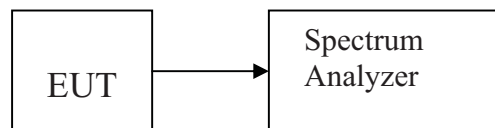
8.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

8.2.3 Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, span=5-30%EBW, detail see the test plot.

8.2.4 Record the max reading.

8.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

8.3 Test Setup



8.4 Test Results

PASS.

Detailed information please see the following page.

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Result
IEEE 802.11b:				
Low	2412	-6.431	8	PASS
Mid	2437	-8.864	8	PASS
High	2462	-8.748	8	PASS
IEEE 802.11g:				
Low	2412	-14.813	8	PASS
Mid	2437	-12.850	8	PASS
High	2462	-13.011	8	PASS
IEEE 802.11n/HT20				
Low	2412	-14.797	8	PASS
Mid	2437	-13.062	8	PASS
High	2462	-13.587	8	PASS
IEEE 802.11n/HT40				
Low	2422	-19.631	8	PASS
Mid	2437	-17.746	8	PASS
High	2452	-18.415	8	PASS

Test plot as follows:

All modes have been tested, the test plot only show the worst mode.

IEEE 802.11b:

CH Low :



CH Mid :



CH High :



9 Bandwidth

9.1 Test limit

Please refer section 15.247

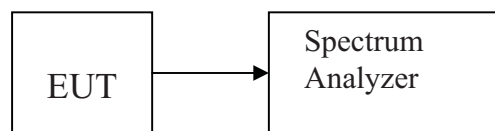
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

9.2 Method of measurement

Details see the KDB558074 D01 DTS Meas Guidance v03r02.

- a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- b) The test receiver set $RBW = 100\text{kHz}$, $VBW \geq 3RBW$, Sweep time set auto, detail see the test plot, Peak detector is used .

9.3 Test Setup



9.4 Test Results

PASS.

Detailed information please see the following page.

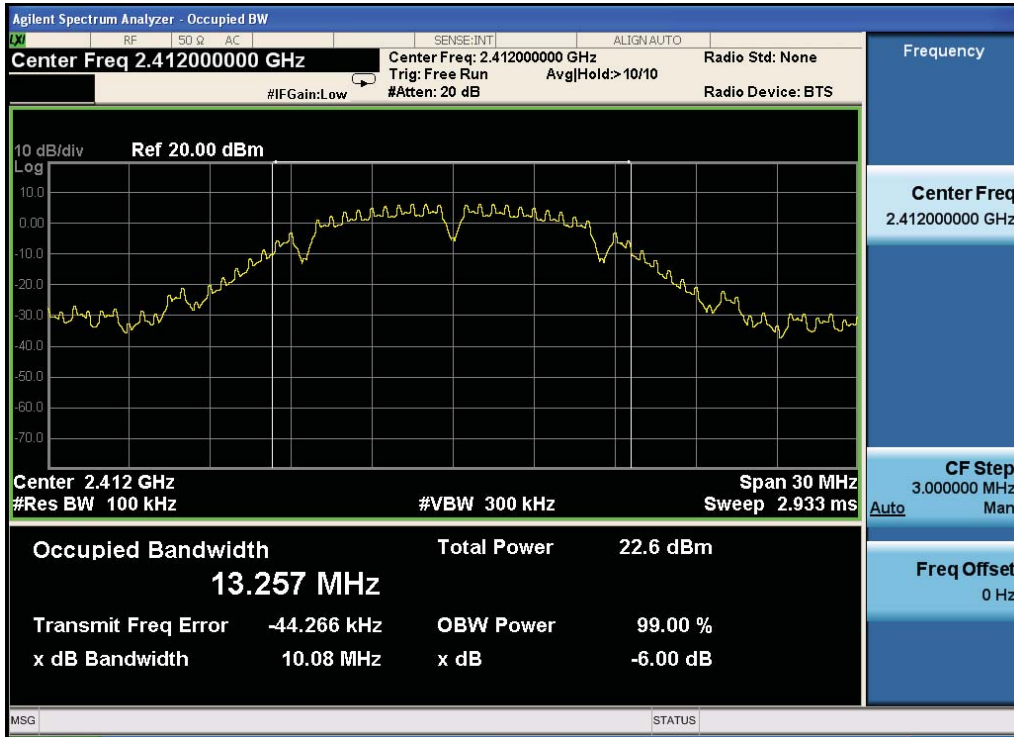
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
IEEE 802.11b:					
Low	2412	10.80	13.257	0.5	PASS
Mid	2437	9.588	13.015	0.5	PASS
High	2462	9.593	12.908	0.5	PASS
IEEE 802.11g:					
Low	2412	15.16	16.384	0.5	PASS
Mid	2437	15.16	16.391	0.5	PASS
High	2462	15.15	16.390	0.5	PASS
IEEE 802.11n/HT20:					
Low	2412	16.91	17.547	0.5	PASS
Mid	2437	16.28	17.551	0.5	PASS
High	2462	16.15	17.547	0.5	PASS
IEEE 802.11n/HT40:					
Low	2422	35.24	35.791	0.5	PASS
Mid	2437	35.22	35.778	0.5	PASS
High	2452	35.24	35.755	0.5	PASS

Test plot as follows:

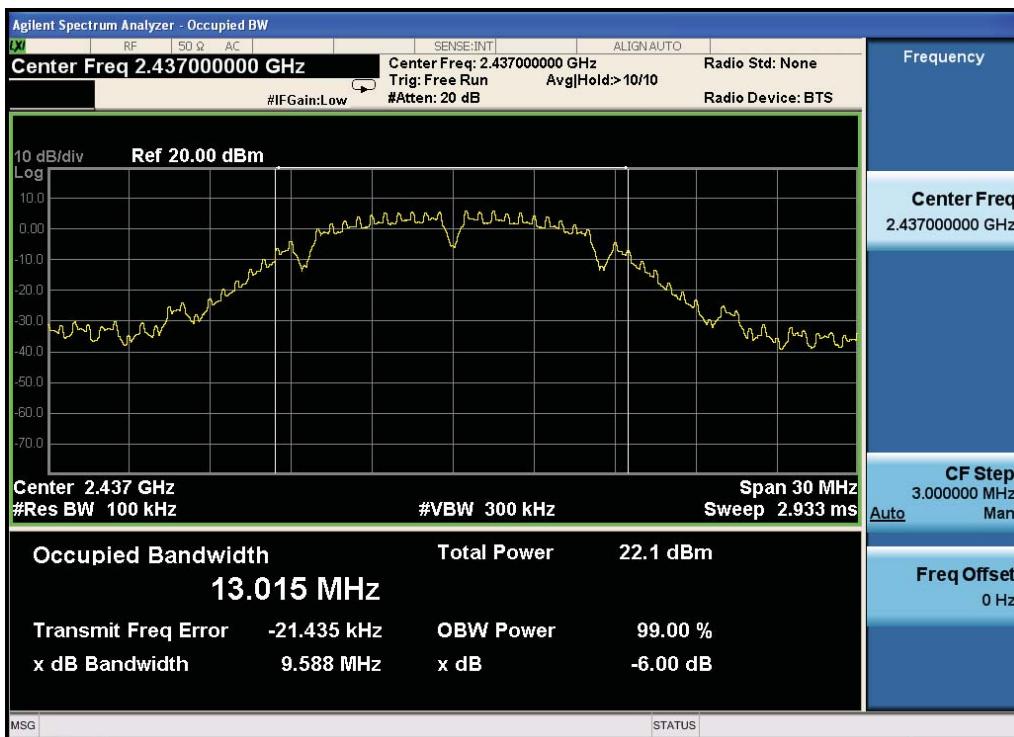
All modes have been tested, the test plot only show the worst mode.

IEEE 802.11b:

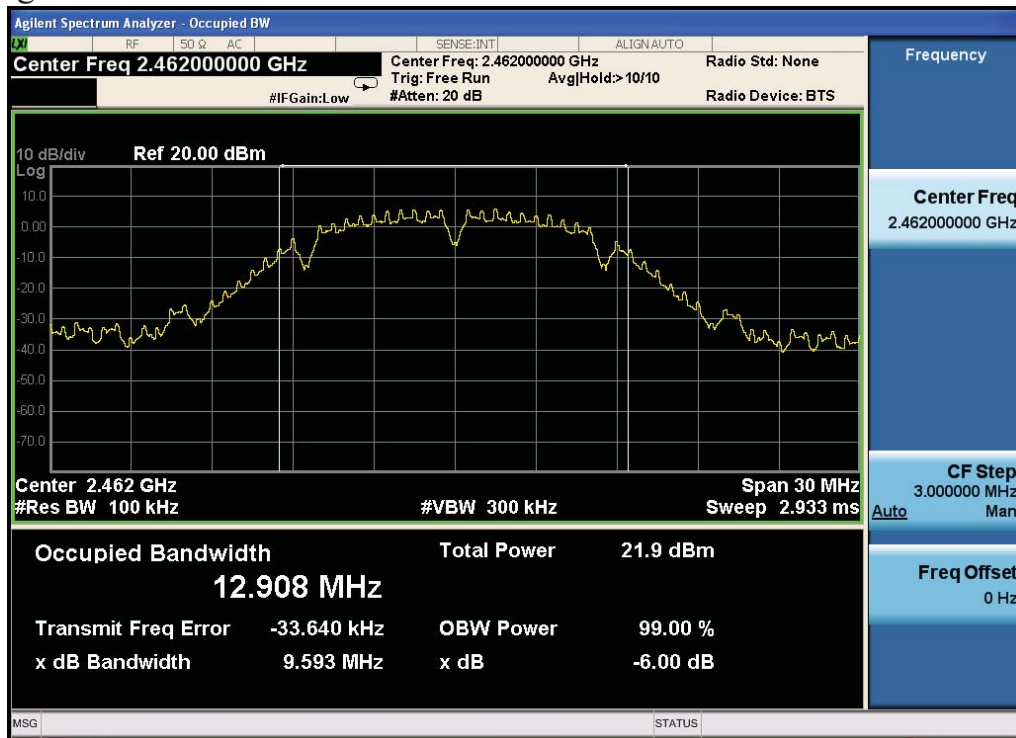
CH Low :



CH Mid :



CH High :



10 Band Edge Check

10.1 Test limit

Please refer section 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 30dB below the fundamental emissions, or comply with 15.209 limits.

10.2 Test Procedure

12.2.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

12.2.2 Check the spurious emissions out of band.

12.2.3 RBW,VBW Setting, please see the following test plot.

10.3 Test Setup

Same as 5.2.2.

10.4 Test Result

PASS.

Detailed information please see the following page.

Remark: All modes have been tested, and only reported worst data of IEEE 802.11b mode.

IEEE 802.11b :

CH LOW : 2412MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23			Test site: 3m Chamber			Tested by: Mason		
Test mode: Tx CH Low 2412MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390	45.52	27.62	3.92	34.97	42.09	74	31.91	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	54.50	27.62	3.94	34.97	51.09	74	22.91	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2390	46.71	27.62	3.92	34.97	43.28	74	30.72	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	52.80	27.62	3.94	34.97	49.39	74	24.61	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK 3, Result = Read level + Antenna factor + cable loss-Amp factor 4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

CH High :2462MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23			Test site: 3m Chamber			Tested by: Mason		
Test mode: Tx CH High 2462MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	45.39	27.59	4.00	34.97	42.01	74	31.99	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2483.5	46.25	27.59	4.00	34.97	42.87	74	31.13	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Note:								
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK								
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK								
3, Result = Read level + Antenna factor + cable loss-Amp factor								
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

IEEE 802.11g :
CH LOW : 2412MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23					Test site: 3m Chamber		Tested by: Mason	
Test mode: Tx CH Low 2412MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390	44.68	27.62	3.92	34.97	41.25	74	32.75	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	53.29	27.62	3.94	34.97	49.88	74	24.12	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2390	46.04	27.62	3.92	34.97	42.61	74	31.39	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	51.38	27.62	3.94	34.97	47.97	74	26.03	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK 3, Result = Read level + Antenna factor + cable loss-Amp factor 4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

CH High :2462MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23			Test site: 3m Chamber			Tested by: Mason		
Test mode: Tx CH High 2462MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	45.30	27.59	4.00	34.97	41.92	74	32.08	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2483.5	45.74	27.59	4.00	34.97	42.36	74	31.64	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Note:								
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK								
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK								
3, Result = Read level + Antenna factor + cable loss-Amp factor								
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

IEEE 802.11n H20 :
CH LOW : 2412MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23			Test site: 3m Chamber			Tested by: Mason		
Test mode: Tx CH Low 2412MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390	44.17	27.62	3.92	34.97	40.74	74	33.26	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	53.28	27.62	3.94	34.97	49.87	74	24.13	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2390	44.96	27.62	3.92	34.97	41.53	74	32.47	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	52.31	27.62	3.94	34.97	48.90	74	25.10	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK 3, Result = Read level + Antenna factor + cable loss-Amp factor 4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

CH High :2462MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23			Test site: 3m Chamber			Tested by: Mason		
Test mode: Tx CH High 2462MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	43.74	27.59	4.00	34.97	40.36	74	33.64	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2483.5	44.81	27.59	4.00	34.97	41.43	74	32.57	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Note:								
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK								
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK								
3, Result = Read level + Antenna factor + cable loss-Amp factor								
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

IEEE 802.11n H40 :
CH LOW : 2422MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23			Test site: 3m Chamber			Tested by: Mason		
Test mode: Tx CH Low 2422MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390	42.98	27.62	3.92	34.97	39.55	74	34.45	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	52.54	27.62	3.94	34.97	49.13	74	24.87	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2390	43.34	27.62	3.92	34.97	40.91	74	33.09	PK
2390	/	27.62	3.92	34.97	/	54	/	AV
2400	50.27	27.62	3.94	34.97	46.86	74	27.14	PK
2400	/	27.62	3.94	34.97	/	54	/	AV
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK 3, Result = Read level + Antenna factor + cable loss-Amp factor 4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

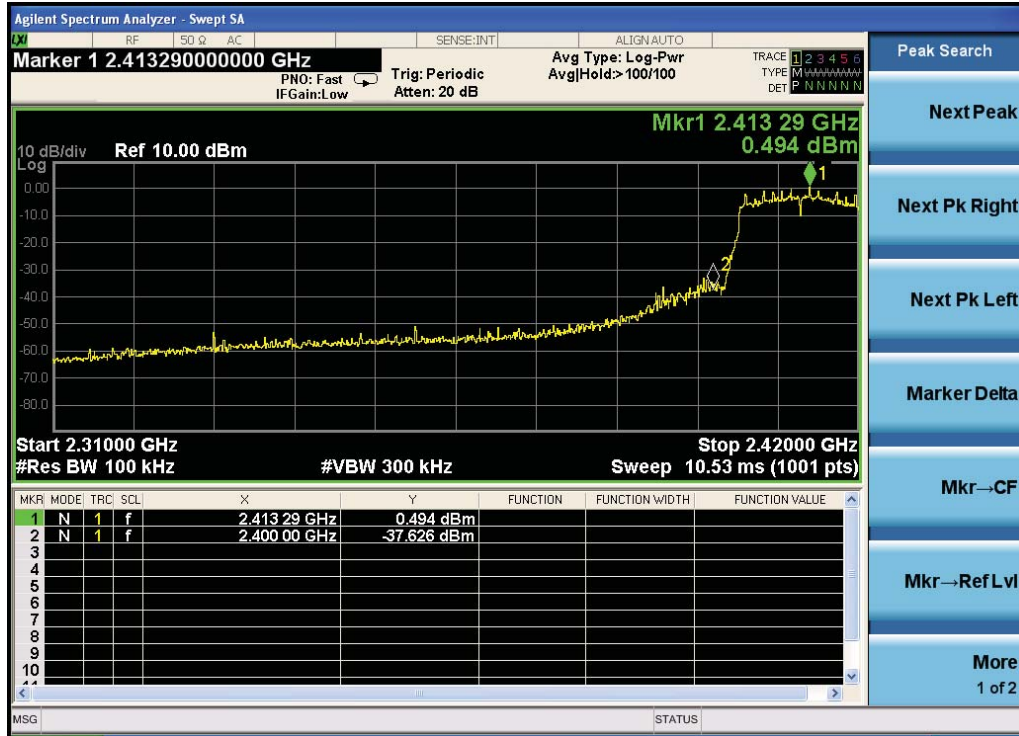
CH High :2452MHz

Band Edge Test result								
EUT: IP cam					M/N: OCamS1			
Power: DC 5.0V From Adapter With AC 120V/60Hz								
Test date: 2015-11-23					Test site: 3m Chamber		Tested by: Mason	
Test mode: Tx CH High 2452MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	42.56	27.59	4.00	34.97	39.18	74	34.82	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Antenna Polarity: Horizontal								
2483.5	43.20	27.59	4.00	34.97	39.82	74	34.18	PK
2483.5	/	27.59	4.00	34.97	/	54	/	AV
Note:								
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK								
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK								
3, Result = Read level + Antenna factor + cable loss-Amp factor								
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

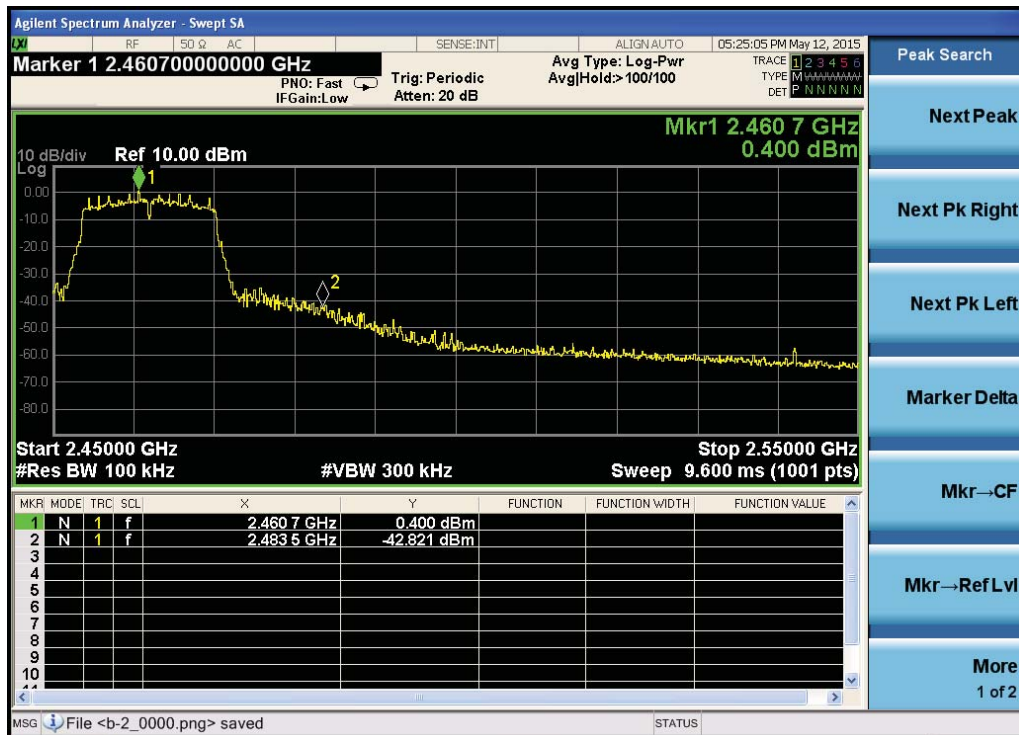
Conducted Method:

IEEE 802.11g :

CH LOW : 2412MHz



CH LOW : 2462MHz



11 Antenna Requirement

11.1 Standard Requirement

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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

11.2 Antenna Connected Construction

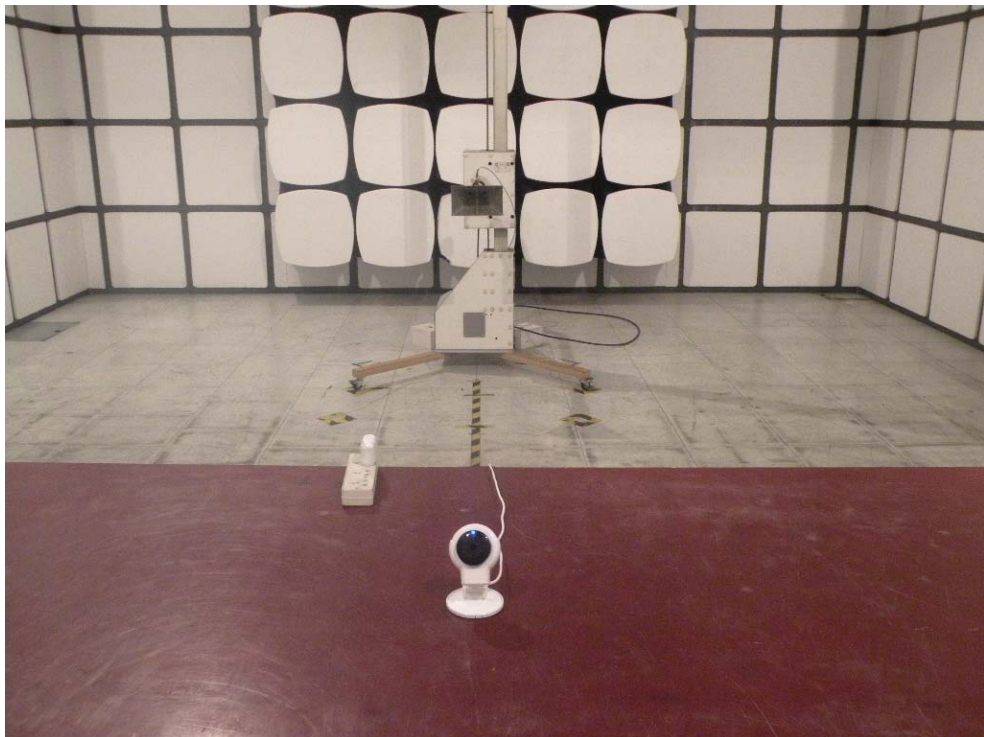
The directional gains of antenna used for transmitting is 1.0 dBi, and the antenna is de-signed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

11.3 Result

The antennas used for this product are PIFA Antenna for WIFI, no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.0dBi for WIFI.

12 Photographs of Test Setup

12.1 Photos of Radiated emission

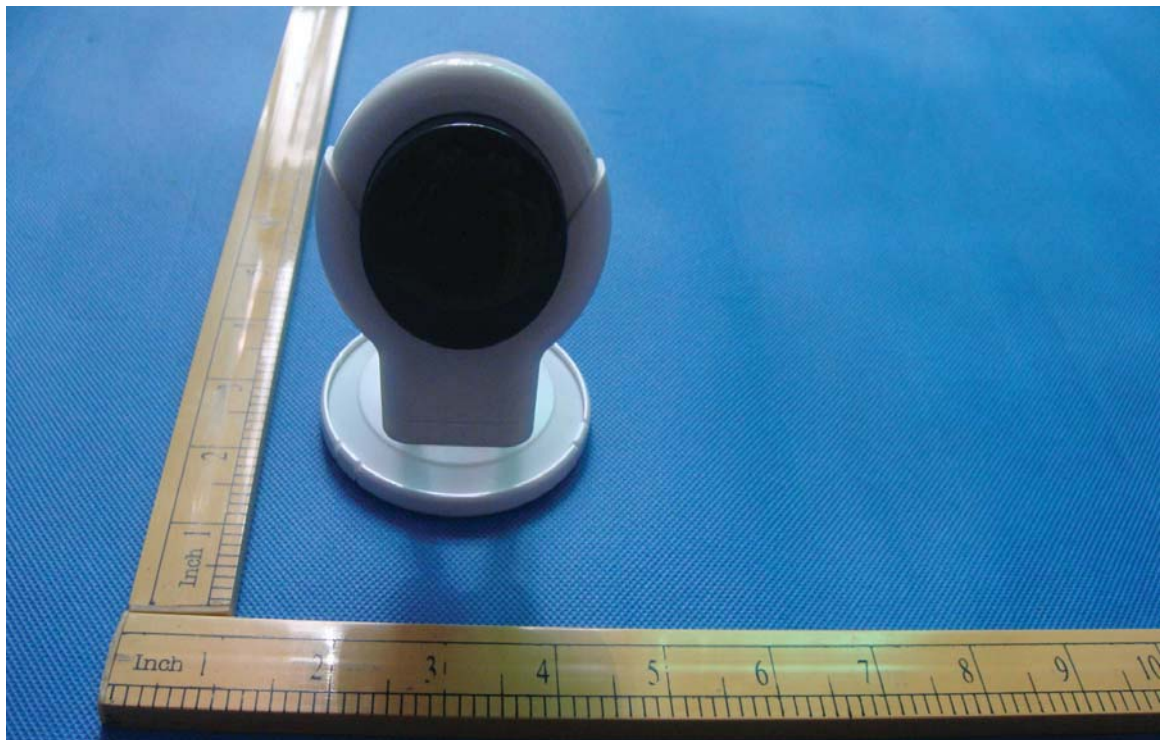


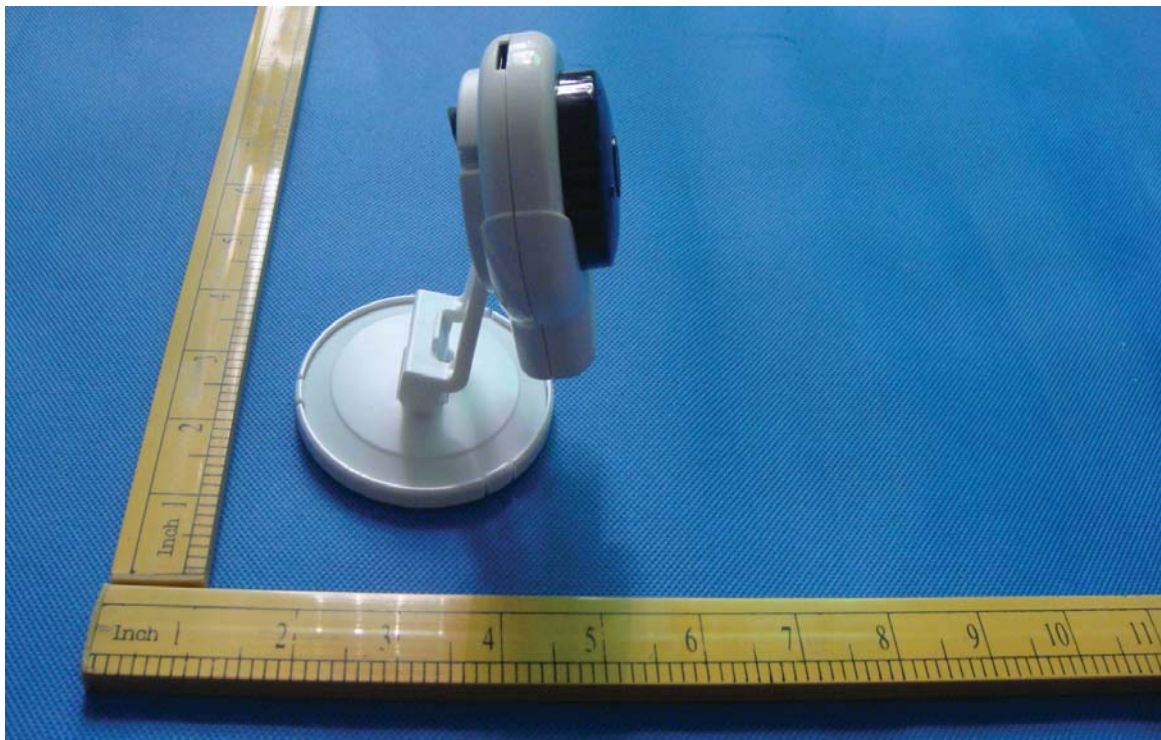
12.2 Photos of Conducted Emission test

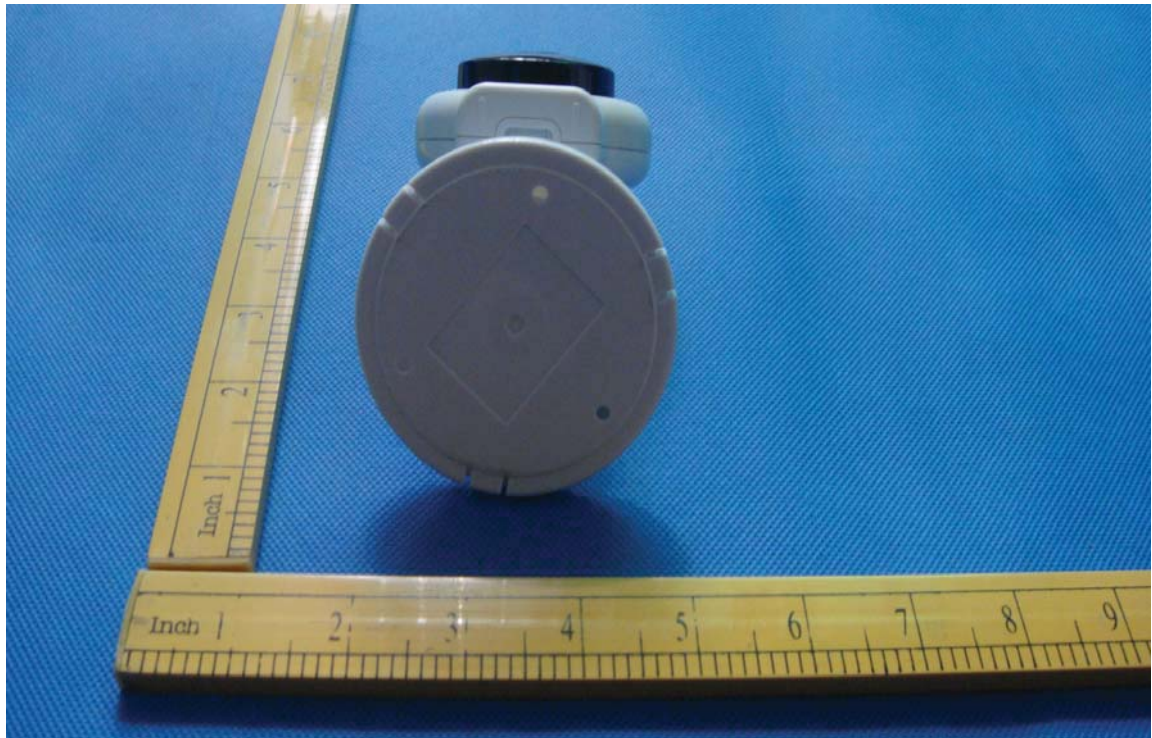


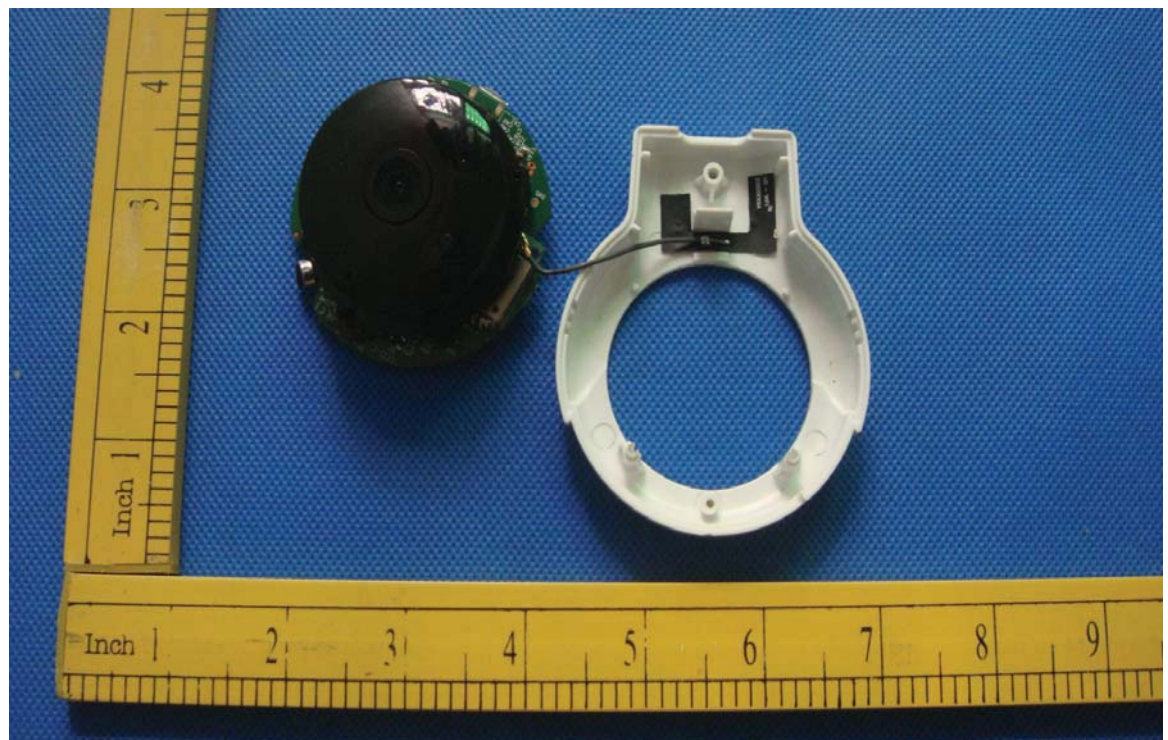
13 Photographs of EUT

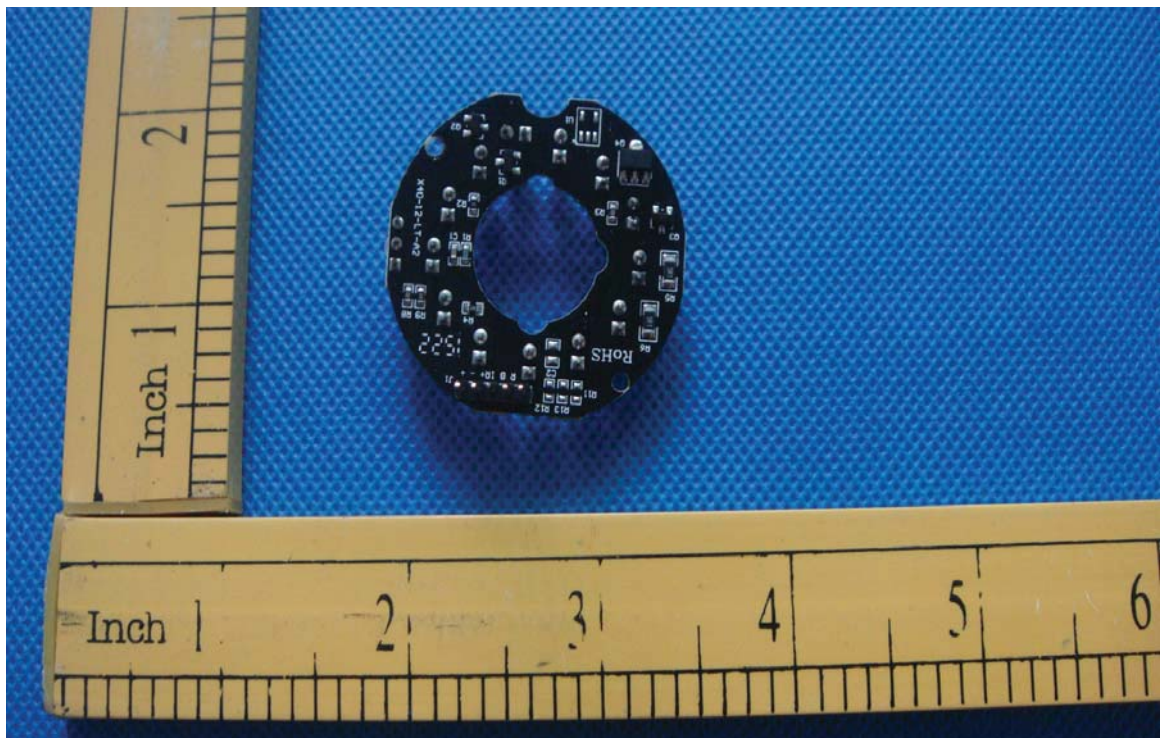
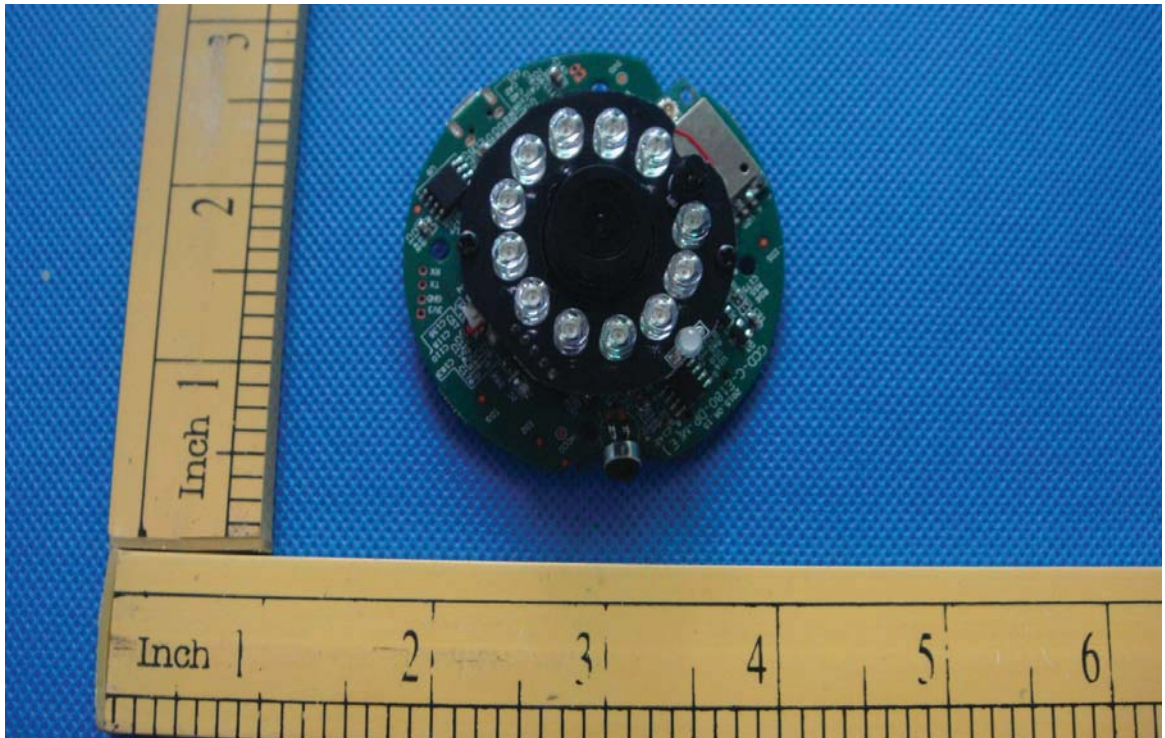


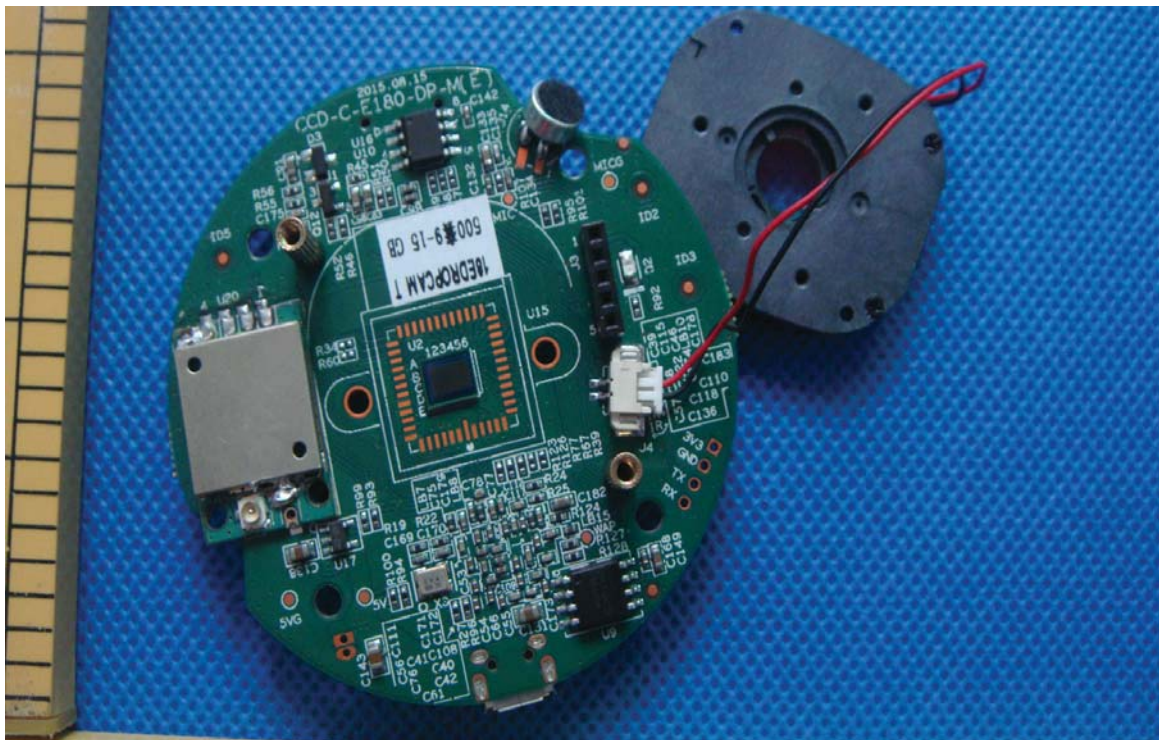
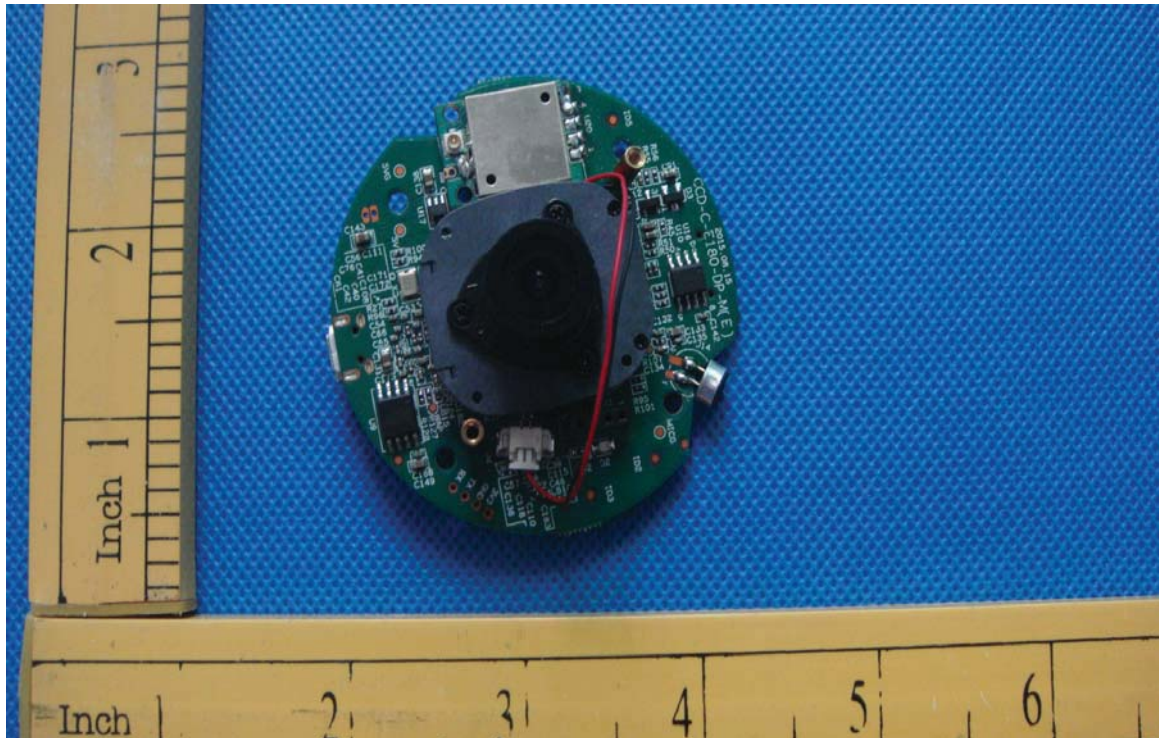


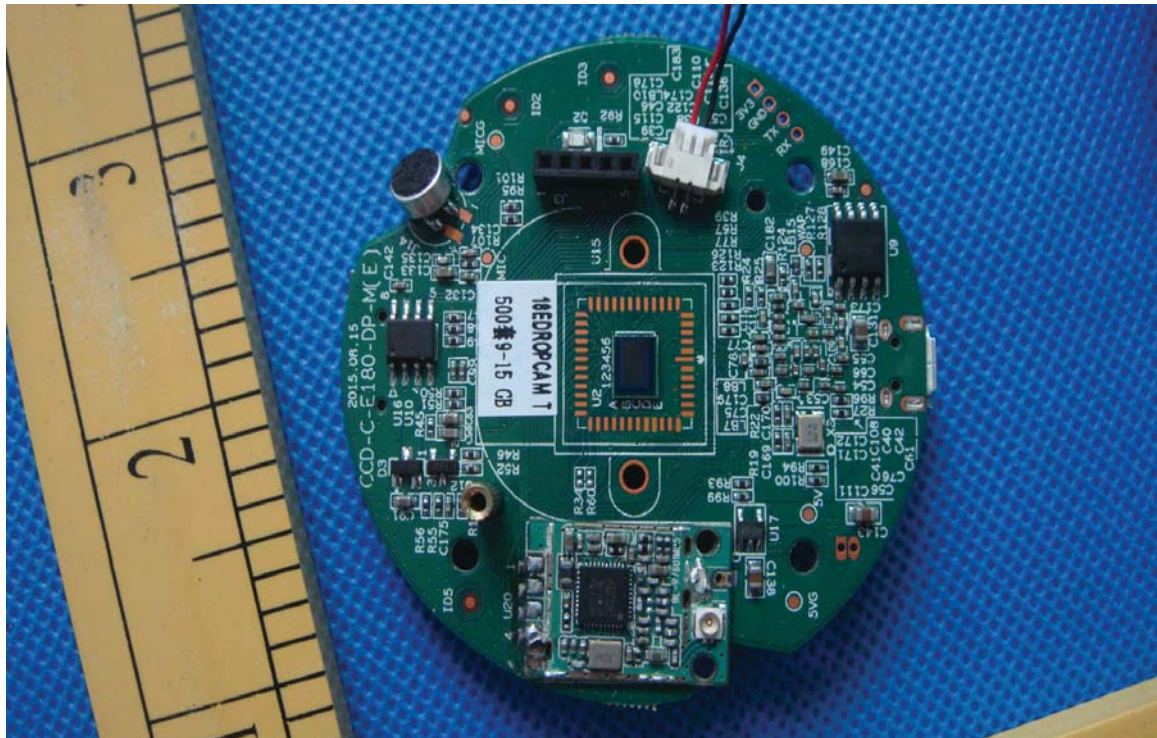












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