Shenzhen EBO Technology Co., Ltd.

1-4F, Huafeng Science Park, Xin'an Sixth Road, 82th District, Bao'an,
Shenzhen, China.
Telephone: +86-755-29451282,
Fax: +86-755-22639141

FCC REPORT

Applicant:	SHENZHEN FATSHARK ELECTRONIC CO., LTD
Address of Applicant:	8FL, Mansion D, Longjing Industry Zone, Bantian, Longgang District, Shenzhen

Equipment Under Test (EUT)

Product Name:	ULTRAMICRO FPV CAMERA
Model No.:	1251
FCC ID:	2ABYQFSV1251
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249:2013
Date of sample receipt:	June 18, 2014
Date of Test:	June 18, 2014 To June 25 2014
Date of report issued:	June 25, 2014
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Kevin Yu
Laboratory Manager

2 Version

Version No.	Date	Description
00	*June 25, 2014*	*Original*

Prepared By:  ***Date:*** *June 25, 2014*

Project Engineer

Check By:  ***Date:*** *June 25, 2014*

Reviewer

3 Contents

Page

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Pass: The EUT complies with the essential requirements in the standard.

N/A: not applicable.

5 General Information

5.1 Client Information

Applicant:	SHENZHEN FATSHARK ELECTRONIC CO., LTD
Address of Applicant:	8FL, Mansion D, Longjing Industry Zone, Bantian, Longgang District, Shenzhen
Manufacturer/Factory:	SHENZHEN FATSHARK ELECTRONIC CO., LTD
Address of Manufacturer/Factory:	8FL, Mansion D, Longjing Industry Zone, Bantian, Longgang District, Shenzhen

5.2 General Description of EUT

Product Name:	ULTRAMICRO FPV CAMERA
Model No.:	1251
Operation Frequency:	5740MHz ~ 5860MHz
Channel numbers:	7
Channel separation:	20MHz
Modulation type:	FM
Antenna Type:	Integral
Antenna gain:	0dBi (declare by Applicant)
Power supply:	3.3-5.5V d.c.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	5740MHz	3	5780MHz	5	5820MHz	7	5860MHz
2	5760MHz	4	5800MHz	6	5840MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	5740MHz
The middle channel	5800MHz
The Highest channel	5860MHz

5.3 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	98.85	103.11	100.79

Final Test Mode:

According to ANSI C63.4 standards, the test results is "worst setup":

Y axis (see the test setup photo)

5.4 Description of Support Units

None.

5.5 Test Facility

MRT Technology (Suzhou) Co., Ltd

FCC Registered Test Site Number: 809388

5.6 Test Location

All tests were performed at:

D8 Building, Youxin Industrial Park, No.2 Tian'e,dang Rd., Wuzhong Economic Development Zone, Suzhou, 215104,China

5.7 Other Information Requested by the Customer

None.

6 Test Instruments list

Radiated Emission

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY5144016A	1 year	2015/01/04
Spectrum Analyzer	Agilent	E4447A	MY45300136	1 year	2014/11/08
Preamplifier	MRT	AP01G18	1310002	1 year	2014/12/14
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2014/11/24
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	1 year	2014/11/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2014/11/24
Broadband Horn Antenna	Schwarzbeck	BBHA9170	9170-549	1 year	2014/12/11
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	1 year	2014/11/15

Conducted Test Equipment

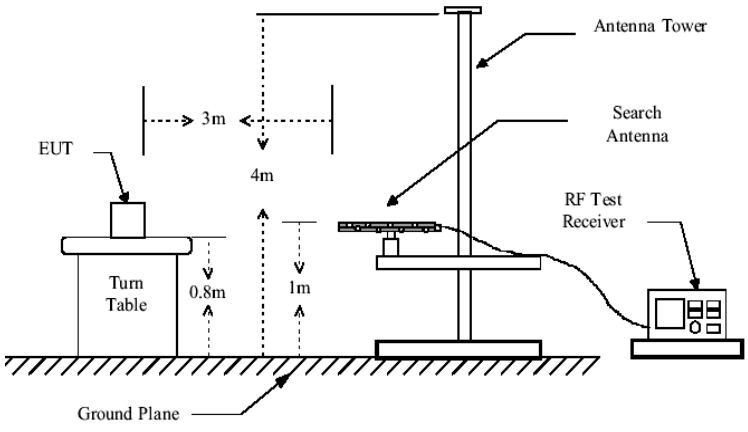
Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY5144016A	1 year	2015/01/04
Power Sensor	Agilent	U2021XA	MY52450003	1 year	2014/12/14
Temperature/Humidity Meter	Anymetre	TH101B	TR3-01	1 year	2014/11/15

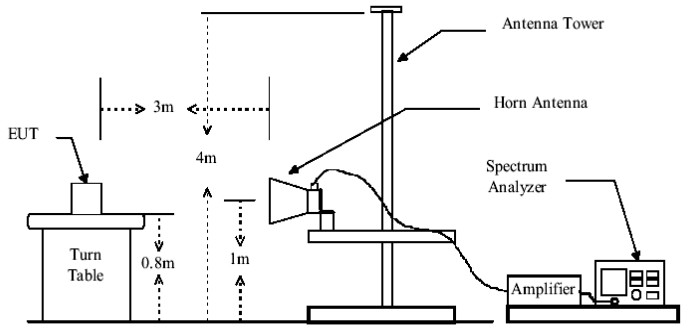
7 Test results and Measurement Data

7.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203
15.203 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, 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.	
E.U.T Antenna:	
The antenna is Integral Antenna, the best case gain of the antenna is 0dBi.	

7.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4:2003</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 40GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
For field strength test, the RBW and VBW were set to 10MHz and 10MHz.
PK detector is used for PK value, AV detector is used for AV value</td></tr>
<tr><td>Limit:
(Field strength of the fundamental signal)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td rowspan="2">5725 ~ 5875MHz</td><td>94.00</td><td>Average Value</td></tr>
<tr><td>114.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(Spurious Emissions)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>30MHz-88MHz</td><td>40.00</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.50</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.00</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.00</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average Value</td></tr>
<tr><td>74.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:
(band edge)</td><td>Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz
 
</td></tr>
</table>

	Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization
5737.00	63.32	37.35	100.67	114.00	-13.33	Horizontal
5740.85	62.95	37.37	100.32	114.00	-13.68	Vertical
5800.43	65.52	37.59	103.11	114.00	-10.89	Horizontal
5800.41	62.08	37.59	99.67	114.00	-14.33	Vertical
5856.85	64.81	37.76	102.57	114.00	-11.43	Horizontal
5860.39	61.42	37.78	99.20	114.00	-14.80	Vertical

Average value:

Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization
5740.81	52.49	37.37	89.86	94.00	-4.14	Horizontal
5740.78	52.33	37.37	89.70	94.00	-4.30	Vertical
5800.85	54.80	37.59	92.39	94.00	-1.61	Horizontal
5800.85	51.54	37.59	89.13	94.00	-4.87	Vertical
5860.78	53.97	37.78	91.75	94.00	-2.25	Horizontal
5860.85	50.41	37.78	88.19	94.00	-5.81	Vertical

Remark:

1. Factor = Antenna Factor + Cable Loss – Preamp Factor
2. Measured Level = Reading Level + Factor

7.2.2 Spurious emissions

Measurement Data:

Below 1GHz

The lowest/middle/highest channels were tested. The worst case is middle channel mode. Only the worst case's data was showing in the report.

Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization
378.01	45.35	-15.44	29.91	46.00	-16.09	Horizontal
619.74	46.25	-11.45	34.80	46.00	-11.20	Horizontal
378.01	46.75	-17.50	29.25	46.00	-16.75	Vertical
619.76	42.40	-11.74	30.66	46.00	-15.34	Vertical

Remark:

1. Factor = Antenna Factor + Cable Loss – Preamp Factor
2. Measured Level = Reading Level + Factor

Above 1GHz:

Test Frequency: 5740MHz						
Peak value						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
11480.50	41.50	19.39	60.89	74.00	-13.11	Horizontal
17220.00	35.15	23.97	59.12	74.00	-14.88	Horizontal
11472.00	39.13	19.37	58.50	74.00	-15.50	Vertical
17220.00	35.34	23.97	59.31	74.00	-14.69	Vertical
Average value:						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
11481.55	31.41	19.39	50.80	54.00	-3.20	Horizontal
17222.60	23.87	24.03	47.90	54.00	-6.10	Horizontal
11481.73	27.78	19.39	47.17	54.00	-6.83	Vertical
17215.25	22.98	23.90	46.88	54.00	-7.12	Vertical

Test Frequency: 5800MHz						
Peak value						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
11599.50	39.71	19.48	59.19	74.00	-14.81	Horizontal
17400.00	34.13	25.52	59.65	74.00	-14.35	Horizontal
11599.50	38.99	19.48	58.47	74.00	-15.53	Vertical
17400.00	33.92	25.52	59.44	74.00	-14.56	Vertical
Average value:						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
11601.68	30.49	19.48	49.97	54.00	-4.03	Horizontal
17402.83	22.27	25.58	47.85	54.00	-6.15	Horizontal
11601.58	27.73	19.48	47.21	54.00	-6.79	Vertical
17402.83	22.03	25.58	47.61	54.00	-6.39	Vertical

Test Frequency: 5860MHz						
Peak value						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
11718.50	40.08	19.30	59.38	74.00	-14.62	Horizontal
17580.00	33.88	26.46	60.34	74.00	-13.66	Horizontal
11718.50	37.56	19.30	56.86	74.00	-17.14	Vertical
17580.00	34.28	26.46	60.74	74.00	-13.26	Vertical
Average value:						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
11721.73	29.42	19.26	48.68	54.00	-5.32	Horizontal
17582.75	22.30	26.50	48.80	54.00	-5.20	Horizontal
11721.78	27.22	19.26	46.48	54.00	-7.52	Vertical
17582.30	21.77	26.50	48.27	54.00	-5.73	Vertical

Note 1: The test trace is same as the ambient noise (the test frequency range:18GHz~40GHz), therefore no data appear in the report.

2: Factor = Antenna Factor + Cable Loss – Preamp Factor

3: Measure Level = Reading Level + Factor.

7.2.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

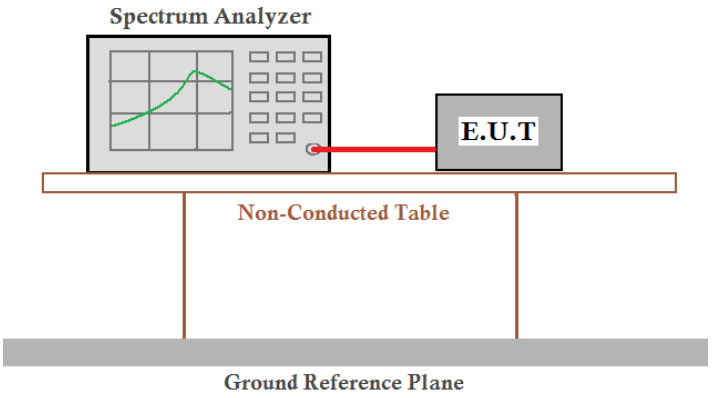
Test Frequency: 5740MHz						
Peak value						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
5725.00	47.63	19.63	67.26	74.00	-6.74	Horizontal
5725.00	46.46	19.51	65.97	74.00	-8.03	Vertical
Average value:						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
5725.00	28.24	19.63	47.87	54.00	-6.13	Horizontal
5725.00	29.08	19.51	48.59	54.00	-5.41	Vertical

Test Frequency: 5860MHz						
Peak value						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
5875.00	43.52	20.29	63.81	74.00	-10.19	Horizontal
5875.00	43.42	20.15	63.57	74.00	-10.43	Vertical
Average value:						
Frequency (MHz)	**Reading Level (dBuV/m)**	**Factor (dB)**	**Measure Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Polarization**
5875.00	27.63	20.29	47.92	54.00	-6.08	Horizontal
5875.00	28.46	20.15	48.61	54.00	-5.39	Vertical

Remark:

1. Factor = Antenna Factor + Cable Loss – Preamp Factor
2. Measured Level = Reading Level + Factor

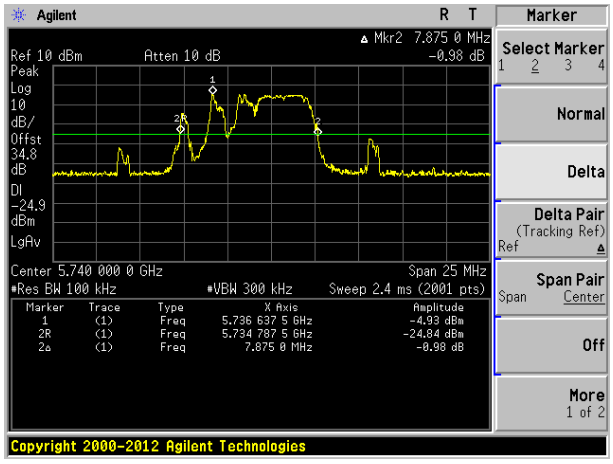
7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.4:2003
Limit:	Operation Frequency range 5725MHz ~ 5875MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

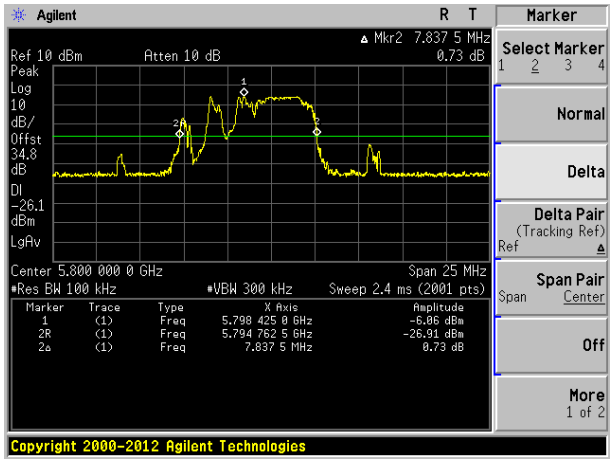
Measurement Data

Test channel	20dB bandwidth(MHz)	Result
Lowest	7.875	Pass
Middle	7.837	Pass
Highest	7.687	Pass

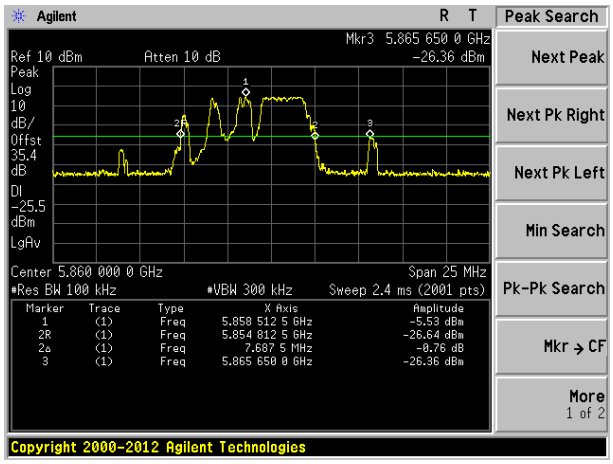
Test plot as follows:



Lowest channel



Middle channel



Highest channel

--End--