



# TEST REPORT

**FCC ID: 2ACYPYN660**

**Applicant** : SHENZHEN YONGNUO PHOTOGRAPHIC EQUIPMENT CO., LTD  
**Address** : B509 5/F, BUILDING 2, SAIGE SCIENCE AND TECHNOLOGY PARK, NORTH OF HUAQIANG ROAD, FUTIAN, SHENZHEN, CHINA.

**Equipment Under Test (EUT):**

Name	:	SPEEDLITE
Model	:	YN660

In Accordance with: FCC PART 15, SUBPART C : 2015 (Section 15.249)

Report No : T1852008 05  
Rev. Rev. 0  
Date of Test : January 04, 2016  
Date of Issue : January 18, 2016  
Test Result : PASS

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

Authorized Signature

(Mark Zhu)  
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 Alpha Product Testing Co., Ltd Or test done by Shenzhen Alpha Product Testing Co., Ltd Approvals in connection with, distribution or use of the product described in this report must be approved by Shenzhen Alpha Product Testing Co., Ltd Approvals in writing.

## TABLE OF CONTENT

<b>1</b>	<b>General Information</b>	<b>3</b>
1.1	Description of Device (EUT)	3
1.2	Description of Test Facility	4
<b>2</b>	<b>EMC Equipment List</b>	<b>4</b>
<b>3</b>	<b>Test Procedure</b>	<b>5</b>
<b>4</b>	<b>Summary of Measurement</b>	<b>6</b>
4.1	Summary of test result	6
4.2	Test connection	6
4.3	Assistant equipment used for test	6
4.4	Test mode	7
4.5	Test Conditions	7
4.6	Measurement Uncertainty (95% confidence levels, k=2)	7
<b>5</b>	<b>Spurious Emission</b>	<b>8</b>
5.1	Radiation Emission	8
5.1.1	Radiation Emission Limits(15.209)	8
5.1.2	Test Setup	8
5.1.3	Test Procedure	10
5.1.4	Test Equipment Setting For emission test Result.	10
5.1.5	Test Condition	10
5.1.6	Test Result	10
<b>6</b>	<b>POWER LINE CONDUCTED EMISSION</b>	<b>16</b>
6.1	Conducted Emission Limits(15.207)	16
6.2	Test Setup	16
6.3	Test Procedure	17
6.4	Test Results	17
<b>7</b>	<b>Bandwidth</b>	<b>18</b>
7.1	Test limit	18
7.2	Method of measurement	18
7.3	Test Setup	18
7.4	Test Results	18
<b>8</b>	<b>Antenna Requirement</b>	<b>21</b>
8.1	Standard Requirement	21
8.2	Antenna Connected Construction	21
8.3	Result	21
<b>9</b>	<b>Photographs of Test Setup</b>	<b>22</b>
4.7	Photos of Radiated emission	22
<b>10</b>	<b>Photographs of EUT</b>	<b>23</b>

# 1 General Information

## 1.1 Description of Device (EUT)

EUT	: SPEEDLITE
Model No.	: YN660
Trade mark	: YONGNUO
Power supply	: DC 6.0V from 4*1.5V AA Battery
Operation frequency	: 2402.5-2456.5MHz
Channel No.	: 16 Channels
Modulation	: GFSK
Antenna Type	: PCB Antenna, max gain 0dBi.
Applicant	: SHENZHEN YONGNUO PHOTOGRAPHIC EQUIPMENT CO., LTD
Address	: B509 5/F, BUILDING 2, SAIGE SCIENCE AND TECHNOLOGY PARK, NORTH OF HUAQIANG ROAD, FUTIAN, SHENZHEN, CHINA.
Manufacturer	: Shenzhen YONGNUO Electrical Equipment Co., Ltd.
Address	: FACTORY 1, WENHAO INDUSTRIAL ESTATE, TONGLE VILLAGE, LONGGANG STREET, LONGGANG DISTRICT, SHENZHEN, CHINA.

## 1.2 Description of Test Facility

Shenzhen Alpha Product Testing Co., Ltd  
 Building B, East Area of Nanchang Second, Industrial Zone, Gushu 2nd Road,  
 Bao'an, Shenzhen, China

August 11, 2014 File on Federal Communication Commission  
 Registration Number: 203110

July 18, 2014 Certificated by IC  
 Registration Number: 12135A

## 2 EMC Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2015.01.19	1 Year
Spectrum analyzer	Agilent	E4407B	MY49510055	2015.01.19	1 Year
Receiver	R&S	ESCI	101165	2015.01.19	1 Year
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2014.01.21	2 Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2014.01.21	2 Year
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170 D(1432)	2014.01.21	2 Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2015.01.19	1 Year
Cable	Resenberger	SUCOFLEX 104	MY6562/4	2015.01.19	1 Year
Cable	Resenberger	SUCOFLEX 104	309972/4	2015.01.19	1 Year
Cable	Resenberger	SUCOFLEX 104	329112/4	2015.01.19	1 Year
Pre-amplifier	SCHWARZBECK	BBV9743	9743-019	2015.01.19	1 Year
Pre-amplifier	Quietek	AP-180C	CHM-0602012	2015.01.19	1 Year
Test Receiver	Rohde & Schwarz	ESCI	101165	2015.01.19	1 Year

### 3 Test Procedure

**POWER LINE CONDUCTED INTERFERENCE:** The test procedure used was ANSI Standard C63.4-2014 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 C63.4-2014 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 C63.4-2014 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 C63.4-2014 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	Standard Paragraph	Result
Spurious Emission	FCC PART 15: 2015	Section 15.249&15.209	Compliance
Conduction Emission	FCC PART 15: 2015	Section 15.207	N/A
Occupied bandwidth	FCC PART 15: 2015	Section 15.249	Compliance
Band edge Requirement	FCC PART 15: 2015	Section 15.249	Compliance
Antenna Requirement	FCC PART 15: 2015	Section 15.203	Compliance

Note: The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.

### 4.2 Test connection

1, EUT was placed on a turn table, which is 0.8 meter high above ground.

**TX Mode:**



### 4.3 Assistant equipment used for test

Description	:	N/A
Manufacturer	:	N/A
Model No.	:	N/A

#### 4.4 Test mode

The EUT was used to control EUT work in Continuous TX mode, and select test channel, wireless mode. New battery is used during all test.

##### Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402.5	9	2429.5
2	2405.5	10	2432.5
3	2408.5	11	2438.5
4	2411.5	12	2441.5
5	2414.5	13	2444.5
6	2417.5	14	2450.5
7	2420.5	15	2453.5
8	2426.5	16	2456.5

#### 4.5 Test Conditions

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

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

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	2.42dB	
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB	Polarize: V
	2.57dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.54dB	Polarize: V
	4.1dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	2.08dB	Polarize: H
	2.56dB	Polarize: V
Uncertainty for radio frequency	$1 \times 10^{-9}$	
Uncertainty for DC and low frequency voltages	0.06%	

## 5 Spurious Emission

### 5.1 Radiation Emission

#### 5.1.1 Radiation Emission Limits(15.209)

Frequencies (MHz)	Field Strength (micorvolts/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

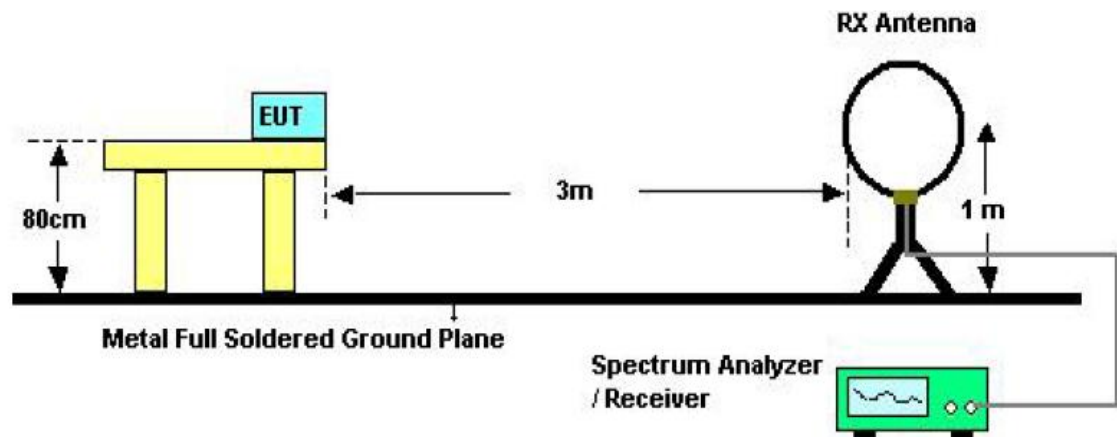
Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit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

**NOTE:**

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

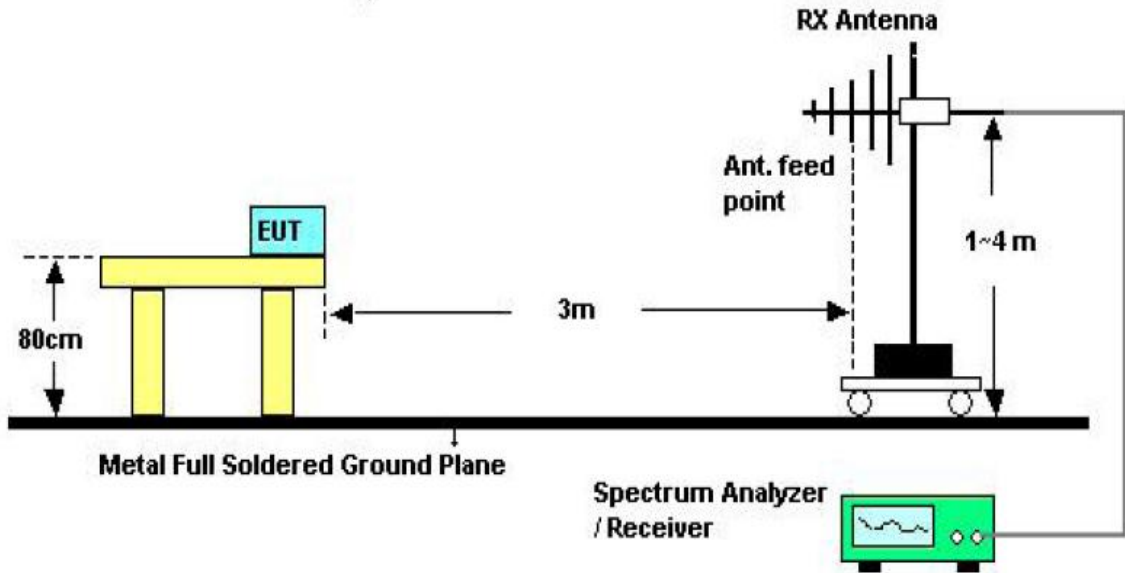
#### 5.1.2 Test Setup

See the next page

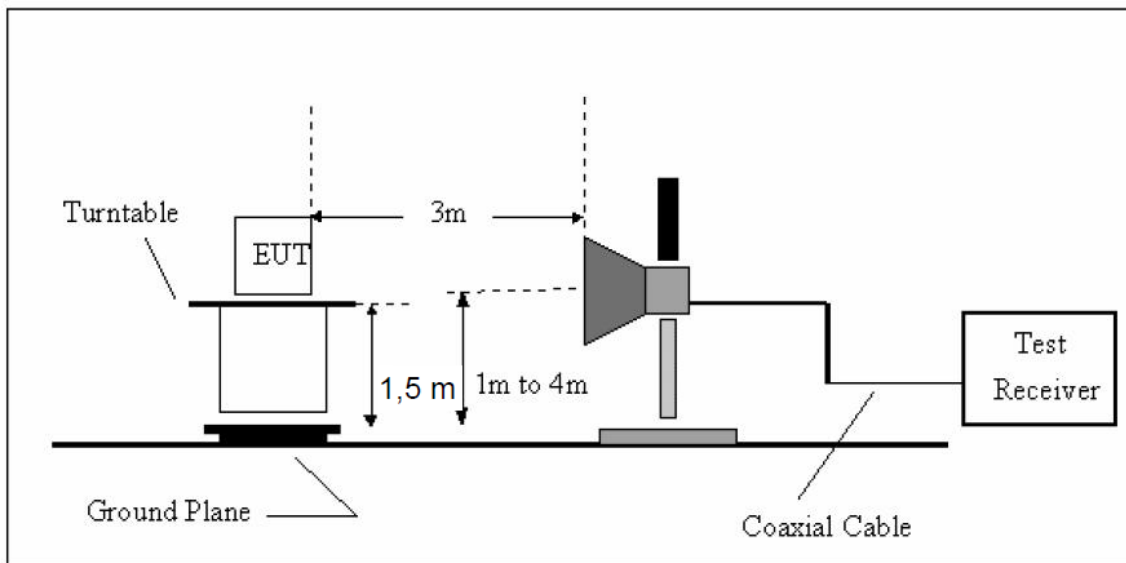


Below 30MHz Test Setup





Above 30MHz Test Setup



Above 1GHz 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.
- f) Test for all x, y, z axes is performed and only the worst case of Y axes was recorded in the test report.

### 5.1.4 Test Equipment Setting For emission test Result.

9KHz~150KHz	RBW 200Hz	VBW1KHz
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 10th harmonic from 9KHz to the EUT.  
Detailed information please see the following page.

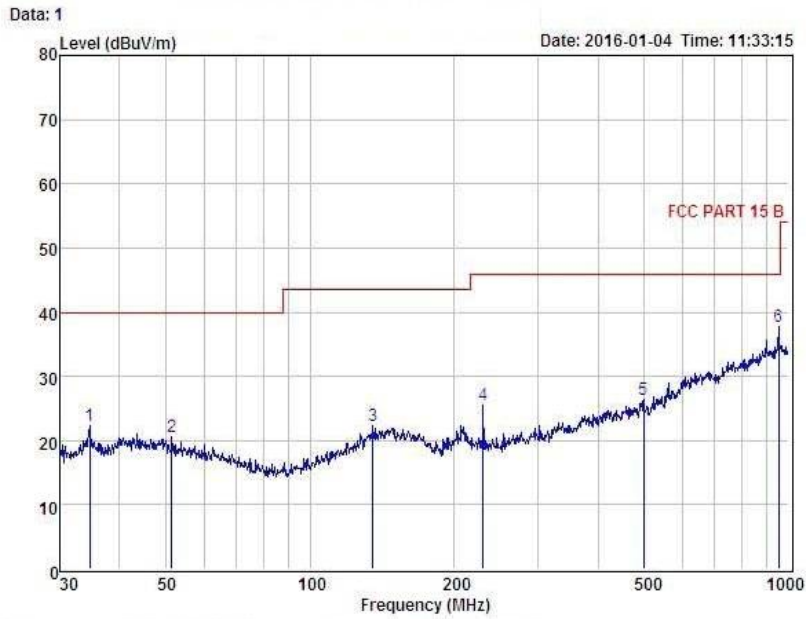
From 9KHz to 30MHz: Conclusion: PASS

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

Remark: Only show the test data of the worst Channel in this report.

From 30MHz to 1000MHz: Conclusion: PASS

Below 1GHz

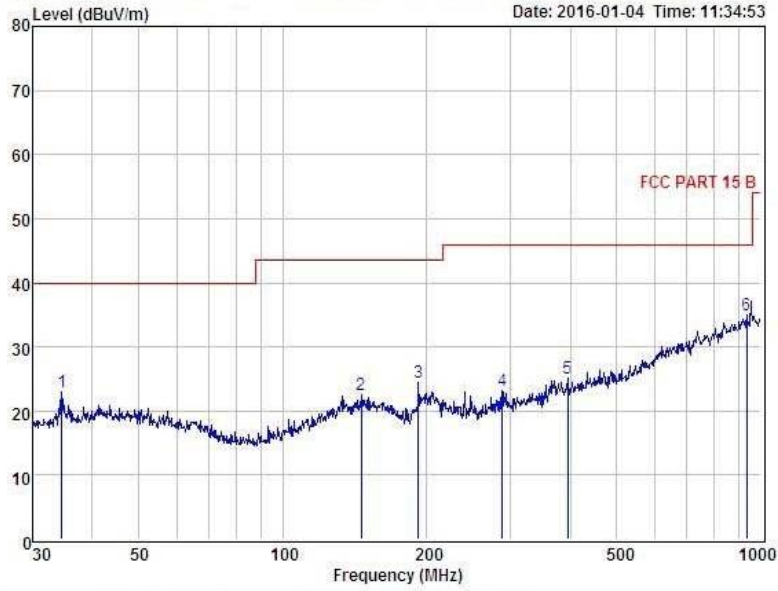


Condition : FCC PART 15 B 3m POL: VERTICAL  
 EUT : SPEEDLITE  
 Model No : YN660  
 Test Mode : TX Mode  
 Power : DC 6V From Battery  
 Test Engineer : Eric  
 Remark :  
 Temp : 24.2°C  
 Hum : 54%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	34.64	39.76	13.33	30.82	0.13	22.40	40.00	-17.60	Peak
2	51.48	37.29	13.38	30.39	0.25	20.53	40.00	-19.47	Peak
3	135.51	38.15	13.08	29.41	0.45	22.27	43.50	-21.23	Peak
4	230.10	41.75	11.21	28.05	0.58	25.49	46.00	-20.51	Peak
5	497.68	35.97	16.48	27.18	1.05	26.32	46.00	-19.68	Peak
6	982.09	38.51	22.15	24.97	1.99	37.68	46.00	-8.32	Peak

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

Data: 2



Condition : FCC PART 15 B 3m POL: HORIZONTAL  
 EUT : SPEEDLITE  
 Model No : YN660  
 Test Mode : TX Mode  
 Power : DC 6V From Battery  
 Test Engineer : Eric  
 Remark :  
 Temp : 24.2°C  
 Hum : 54%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	34.52	40.32	13.33	30.82	0.13	22.96	40.00	-17.04	Peak
2	145.86	37.50	13.90	29.41	0.44	22.43	43.50	-21.07	Peak
3	192.42	42.48	10.36	28.92	0.58	24.50	43.50	-19.00	Peak
4	287.99	38.12	12.54	28.06	0.66	23.26	46.00	-22.74	Peak
5	394.85	37.07	14.64	27.36	0.67	25.02	46.00	-20.98	Peak
6	935.55	37.01	22.04	25.00	0.95	35.00	46.00	-11.00	Peak

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

## Radiated Emissions Result of Inside band and out of band

1GHz—25GHz Radiated emission Test result									
EUT: SPEEDLITE					M/N: YN660				
Power: DC 6V From battery									
Test date: 2016-01-05 Test site: 3m Chamber Tested by: Eric									
Test mode: 2402.5MHz									
Antenna polarity: Vertical									
No	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
1	2402.5	89.43	27.61	3.94	34.97	86.01	114	27.99	PK
2	2402.5	70.62	27.61	3.94	34.97	67.2	94	26.8	AV
3	4805	60.25	31.29	5.70	34.19	63.05	74	10.95	PK
4	4805	43.49	31.29	5.70	34.19	46.29	54	7.71	AV
5	2400	50.71	27.62	3.94	34.97	47.3	74	26.7	PK
6	2400	39.45	27.62	3.94	34.97	36.04	54	17.96	AV
	/								
Antenna Polarity: Horizontal									
1	2402.5	89.52	27.61	3.94	34.97	86.1	114	27.9	PK
2	2402.5	68.96	27.61	3.94	34.97	65.54	94	28.46	AV
3	4805	56.45	31.29	5.70	34.19	59.25	74	14.75	PK
4	4805	41.27	31.29	5.70	34.19	44.07	54	9.93	AV
5	2400	53.03	27.62	3.94	34.97	49.62	74	24.38	PK
6	2400	41.56	27.62	3.94	34.97	38.15	54	15.85	AV
	/	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2, Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: RMS									
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.									

EUT: SPEEDLITE					M/N: YN660				
Power: DC 6V From battery									
Test date: 2016-01-05      Test site: 3m Chamber      Tested by: Eric									
Test mode: 2426.5MHz									
Antenna polarity: Vertical									
No	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
1	2426.5	88.75	27.60	3.97	34.97	85.35	114	28.65	PK
2	2426.5	70.68	27.60	3.97	34.97	67.28	94	26.72	AV
3	4853	59.43	31.38	5.75	34.14	62.42	74	11.58	PK
4	4853	41.55	31.38	5.75	34.14	44.54	54	9.46	AV
	/	/							
Antenna Polarity: Horizontal									
1	2426.5	87.12	27.60	3.97	34.97	83.72	114	30.28	PK
2	2426.5	69.34	27.60	3.97	34.97	65.94	94	28.06	AV
3	4853	57.33	31.38	5.75	34.14	60.32	74	13.68	PK
4	4853	40.97	31.38	5.75	34.14	43.96	54	10.04	AV
	/	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2,Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2,Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: RMS									
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.									

EUT: SPEEDLITE M/N: YN660									
Power: DC 6V From battery									
Test date: 2016-01-05 Test site: 3m Chamber Tested by: Eric									
Test mode: 2456.5MHz									
Antenna polarity: Vertical									
No	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
1	2456.5	88.74	27.59	4.00	34.97	85.36	114	28.64	PK
2	2456.5	70.32	27.59	4.00	34.97	66.94	94	27.06	AV
3	4913	58.49	31.43	5.79	34.12	61.59	74	12.41	PK
4	4913	42.06	31.43	5.79	34.12	45.16	54	8.84	AV
5	2483.5	52.44	27.59	4	34.97	49.06	74	24.94	PK
6	2483.5	36.89	27.59	4	34.97	33.51	54	20.49	AV
	/	/							
Antenna Polarity: Horizontal									
1	2456.5	88.01	27.59	4.00	34.97	84.63	114	29.37	PK
2	2456.5	67.54	27.59	4.00	34.97	64.16	94	29.84	AV
3	4913	57.43	31.43	5.79	34.12	60.53	74	13.47	PK
4	4913	42.59	31.43	5.79	34.12	45.69	54	8.31	AV
5	2483.5	51.87	27.59	4	34.97	48.49	74	25.51	PK
6	2483.5	39.46	27.59	4	34.97	36.08	54	17.92	AV
	/	/							
Note:									
1, Measuring frequency from 1GHz to 25GHz									
2, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK									
2,Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: RMS									
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.									

## 6 POWER LINE CONDUCTED EMISSION

### 6.1 Conducted Emission Limits(15.207)

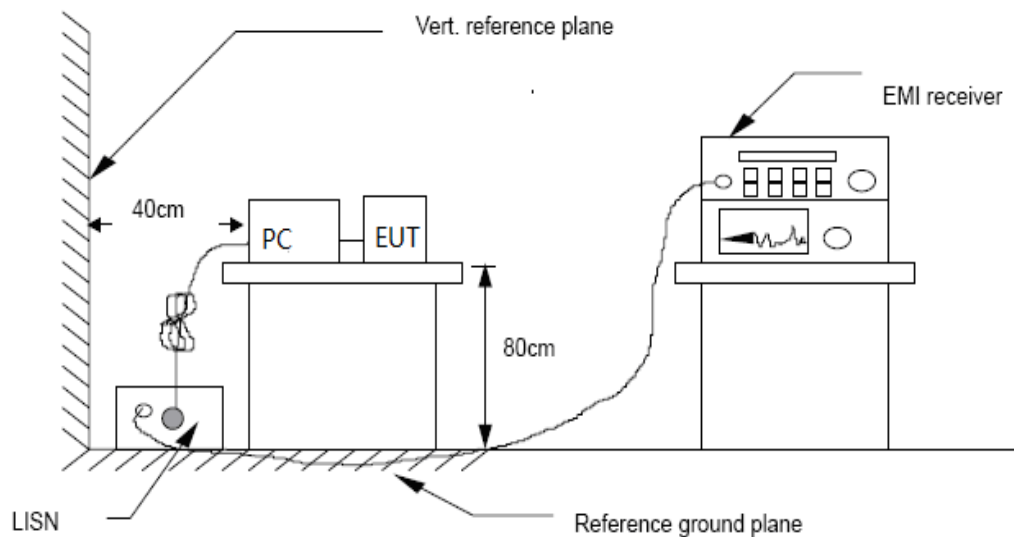
Frequency MHz	Limits dB( $\mu$ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

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 C63.4-2014 on Conducted Emission Measurement. The bandwidth of test receiver (R & S ESCS30) is set at 9 kHz.

### 6.4 Test Results

Not apply to battery operated products.

## 7 Bandwidth

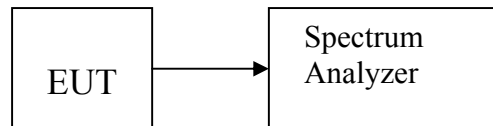
### 7.1 Test limit

Please refer section 15.249

### 7.2 Method of measurement

- 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 RBW set 30KHz, VBW set 100KHz, Sweep time set auto. Peak detector is used

### 7.3 Test Setup



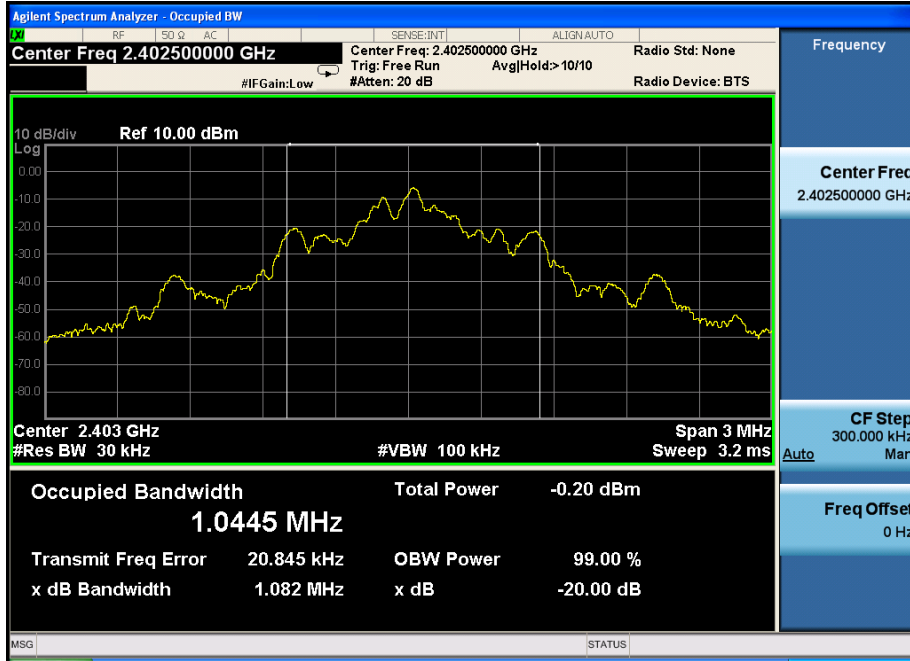
### 7.4 Test Results

PASS.

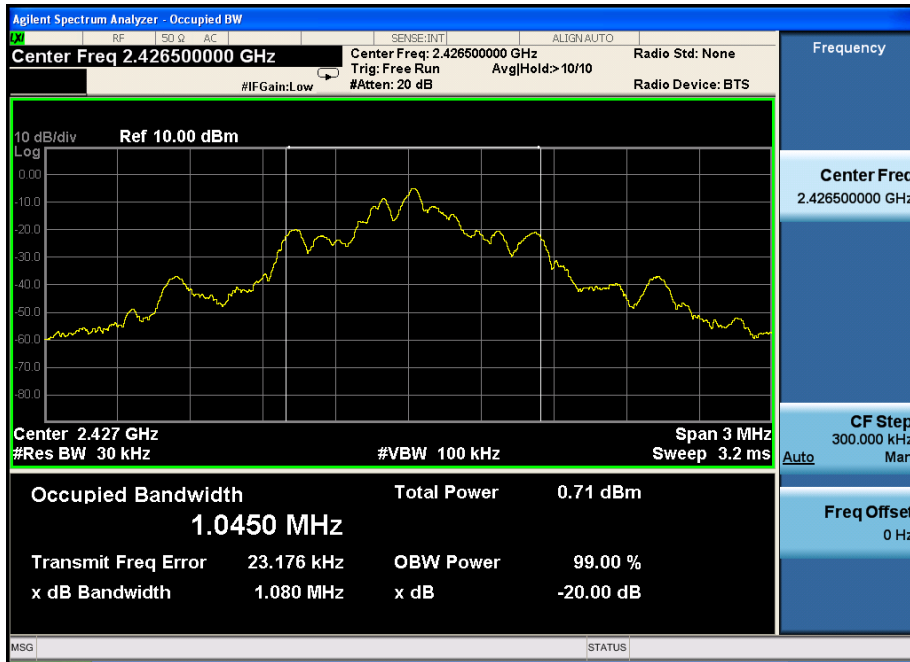
Detailed information please see the following page.

Channel	Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
CH1	2402.5	1082	/	PASS
CH4	2426.5	1080	/	PASS
CH8	2456.5	1078	/	PASS

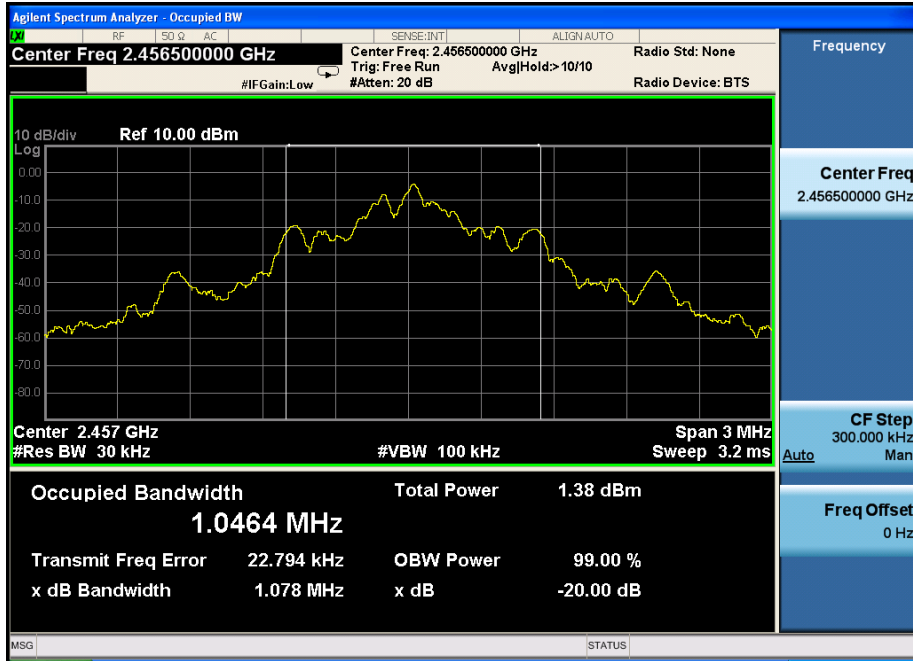
CH Low :



CH Mid :



CH High :



## 8 Antenna Requirement

### 8.1 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.

### 8.2 Antenna Connected Construction

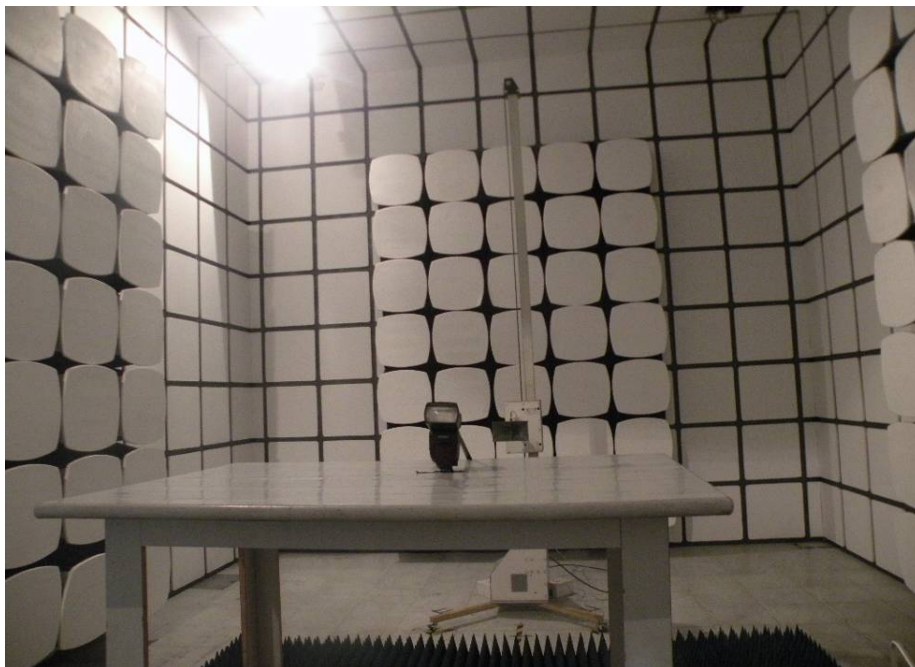
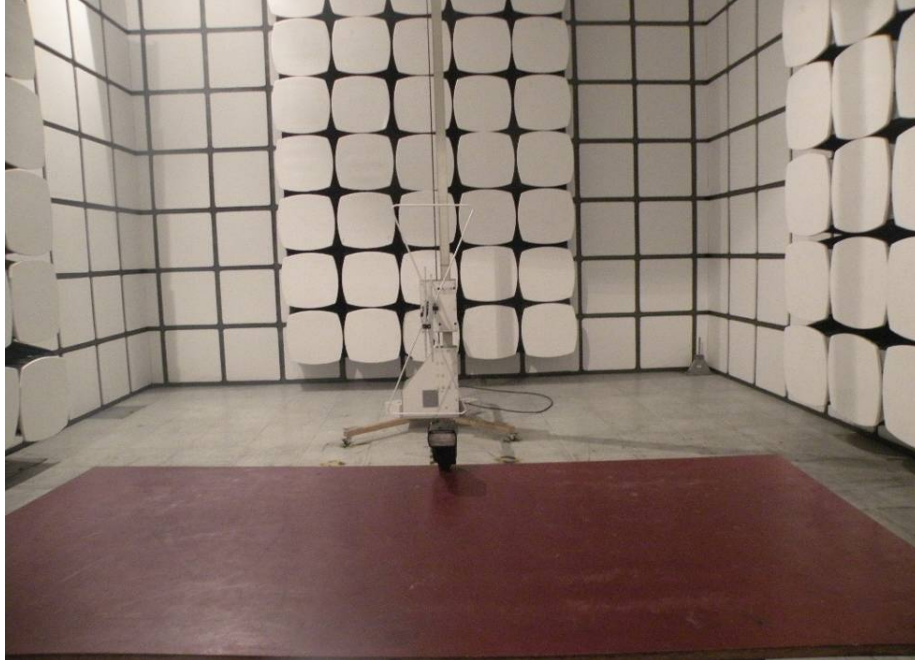
The directional gains of antenna used for transmitting is 0dBi, and is a PCB Antenna and no consideration of replacement. Please see EUT photo for details.

### 8.3 Result

The EUT antenna is PCB Antenna. It comply with the standard requirement.

## 9 Photographs of Test Setup

### 4.7 Photos of Radiated emission



## 10 Photographs of EUT











-----THE END OF REPORT-----