

## FCC PART 15.249

## TEST REPORT

For

### Shantou Yike hobby Industrial Co., Ltd

Building A1/8, Qilong Building, Dengfeng Road, Chenghai District, Shantou, Guangdong, China

**FCC ID: 2AHVGYK022**

<b>Report Type:</b> Original Report	<b>Product Type:</b> 2.4G control RC quadcopter/helicopter
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<b>Report Number:</b> RSZ151210004-00A	
<b>Report Date:</b> 2016-04-08	
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Shantou Yike hobby Industrial Co., Ltd*'s product, model number: *YK022 (FCC ID: 2AHVGYK022)* or the "EUT" in this report was a *2.4G control RC quadcopter/helicopter*, the control RC quadcopter unit was measured approximately: 23.0 mm (L) x 17.5 mm (W) x 8.0 mm (H), rated with input voltage: DC 4\*1.5V AA battery.

*Note: This series products model: YK016, YK017, YK018, YK019, YK020, YK021, YK023, YK024, YK025, YK026, YK027, YK028, YK029, YK030, YK031, YK032, YK033, YK034, YK035, YK036, YK037, YK038, YK039, YK040, HS170, HS170C, HS170W, HS170G, HS171, HS171C, HS171W, HS171G, HS172, HS173, HS174, HS175, HS176, HS177, HS178, HS179 and YK022 are identical schematics, the difference among them is just the model number due to marketing purpose, and model YK022 was selected for fully testing, the detailed information can be referred to the declaration letter that stated and guaranteed by the applicant.*

*\*All measurement and test data in this report was gathered from production sample serial number: 1507339 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-12-10.*

### Objective

This type approval report is prepared on behalf of *Shantou Yike hobby Industrial Co., Ltd* in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

### Related Submittal(s)/Grant(s)

No related submittal(s).

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz.and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

## **Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10-2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in engineering mode.

### EUT Exercise Software

No exercise software was made to the EUT tested.

### Equipment Modifications

No modifications were made to the unit tested.

### Support Equipment List and Details

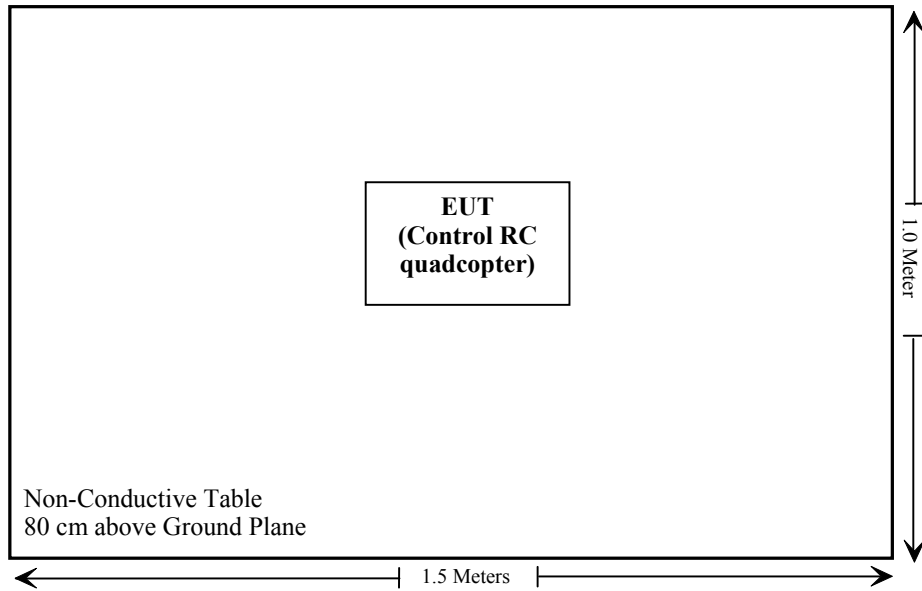
Manufacturer	Description	Model	Serial Number
/	/	/	/

### Support Cable Descriptions

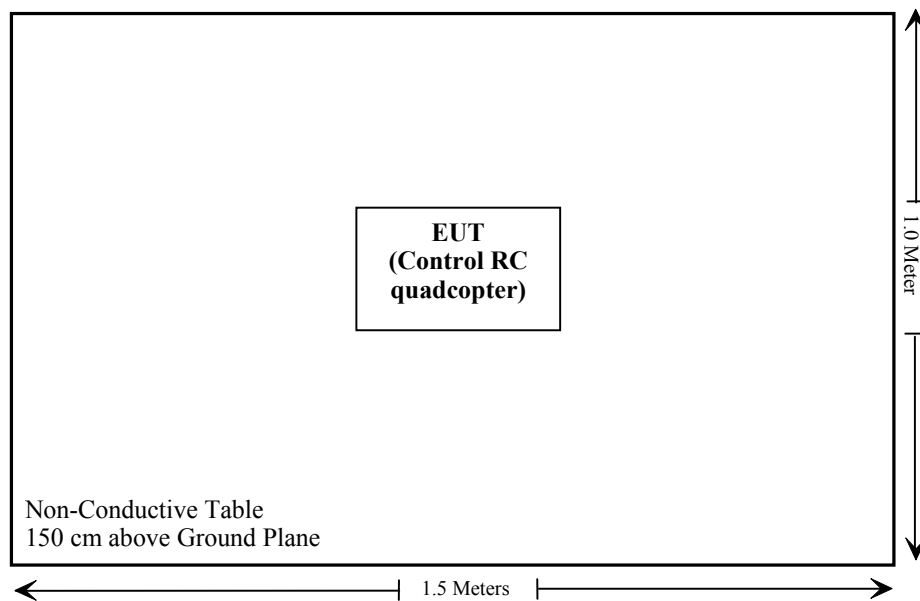
Cable Description	Length (m)	From/Port	To
/	/	/	/

## Block Diagram of Test Setup

For Below 1GHz setup



For Above 1GHz setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§ 15.203	Antenna Requirement	Compliance
§ 15.207(a)	Conduction Emissions	Not Applicable
15.205, § 15.209, § 15.249	Radiated Emissions	Compliance
§ 15.215 (c)	20 dB Bandwidth	Compliance

Note: EUT was powered by battery only.

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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

### **Antenna Connector Construction**

The EUT has one internal antenna arrangement for transmitting, which was permanently attached and the antenna gain is 3.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliant.



**FCC§15.205, §15.209 & §15.249 - RADIATED EMISSIONS****Applicable Standard**

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

**Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is 5.91 dB for 30MHz-1GHz, 4.92 dB for above 1GHz, and it will not be taken into consideration for the test data recorded in the report

**Test Equipment Setup**

The spectrum analyzer or receiver is set as:

Below 1000MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

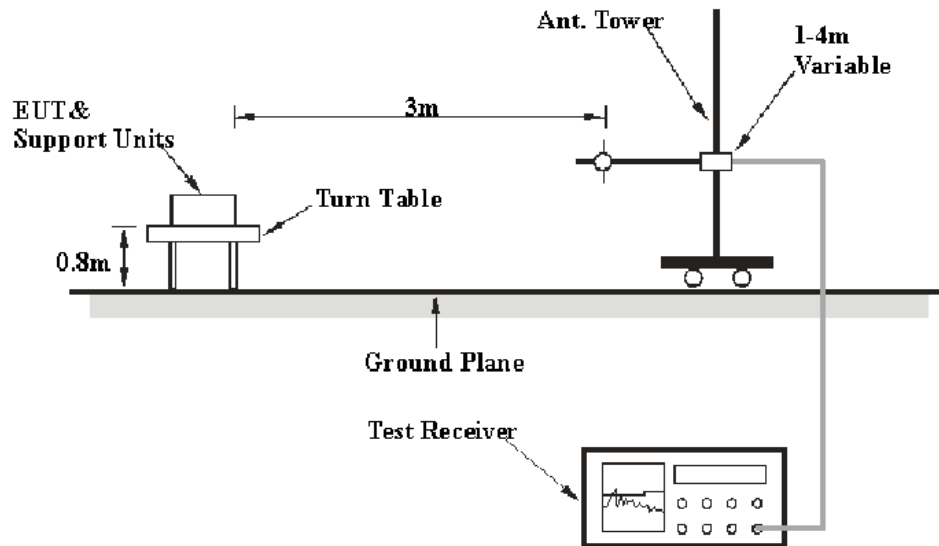
Above 1000MHz:

Peak: RBW = 1MHz / VBW = 3MHz / Sweep = Auto

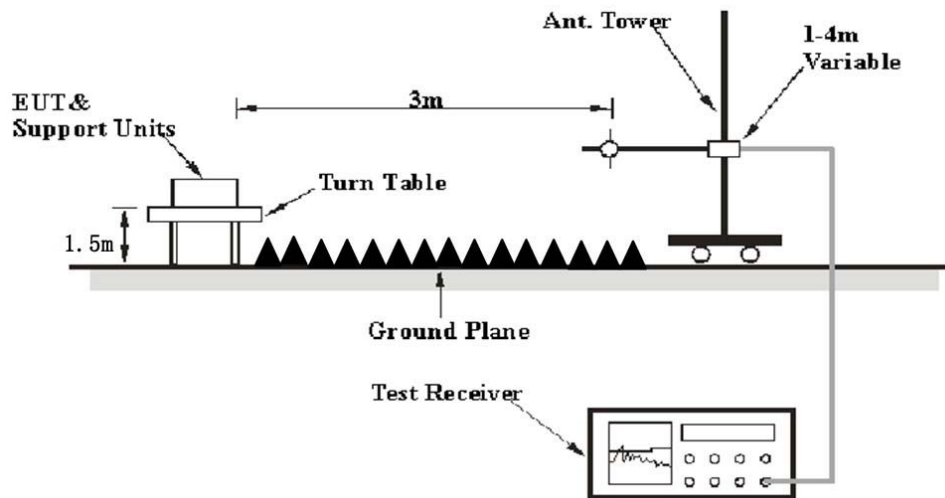
Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

## EUT Setup

Below 1G:



Above 1GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane for below 1GHz and 1.5 meter above ground plane for above 1GHz, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2015-05-06	2016-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2015-12-15	2016-12-14
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-23
DUCOMMUN	Pre-amplifier	ALN-22093530-01	991373-01	2015-11-24	2016-11-23
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2015-06-13	2016-06-13
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2013-10-14	2016-10-13
Rohde & Schwarz	Auto test Software	EMC32	V9.10	NCR	NCR
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369223410-001	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	104PEA	218124002	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	RG-214	1	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	RG-214	2	2015-06-15	2016-06-15

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Results Summary

According to the data in the following table, the worst margin reading as below:

**3.05 dB at 2483.51 MHz in the Horizontal polarization for High Channel**

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL,  $U_{(L_m)}$  is less than  $U_{\text{cispr}}$ , if  $L_m$  is less than  $L_{\text{lim}}$ , it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

Temperature:	18 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

*The testing was performed by Hill He on 2016-01-11.*

*Test Mode: Transmitting*

**30 MHz to 25 GHz:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.249/15.205/15.209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2405 MHz)									
384.13	51.16	QP	288	1.5	H	-11.1	40.06	46	5.94
2405.00	101.71	PK	6	2.2	H	-6.46	95.25	114	18.75
2405.00	80.41	Ave.	6	2.2	H	-6.46	73.95	94	20.05
2405.00	95.07	PK	187	2.3	V	-6.46	88.61	114	25.39
2405.00	73.38	Ave.	187	2.3	V	-6.46	66.92	94	27.08
2388.47	64.95	PK	319	2.0	H	-6.46	58.49	74	15.51
2388.47	31.73	Ave.	319	2.0	H	-6.46	25.27	54	28.73
2389.59	65.27	PK	130	2.0	H	-6.46	58.81	74	15.19
2389.59	32.26	Ave.	130	2.0	H	-6.46	25.80	54	28.20
2400.00	72.89	PK	6	2.2	H	-6.46	66.43	74	7.57
2400.00	43.38	Ave.	6	2.2	H	-6.46	36.92	54	17.08
2484.82	51.91	PK	140	2.5	H	-4.74	47.17	74	26.83
2484.82	31.43	Ave.	140	2.5	H	-4.74	26.69	54	27.31
4810.00	58.93	PK	119	1.1	H	3.79	62.72	74	11.28
4810.00	38.08	Ave.	119	1.1	H	3.79	41.87	54	12.13
7215.00	45.49	PK	93	1.7	H	9.79	55.28	74	18.72
7215.00	27.01	Ave.	93	1.7	H	9.79	36.80	54	17.20
9620.00	40.31	PK	182	1.7	V	11.85	52.16	74	21.84
9620.00	22.36	Ave.	182	1.7	V	11.85	34.21	54	19.79

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.249/15.205/15.209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2445 MHz)									
384.13	51.21	QP	288	1.5	H	-11.1	40.11	46	5.89
2445.00	102.81	PK	329	1.9	H	-6.46	96.35	114	17.65
2445.00	81.63	Ave.	329	1.9	H	-6.46	75.17	94	18.83
2445.00	93.91	PK	23	2.5	V	-6.46	87.45	114	26.55
2445.00	72.31	Ave.	23	2.5	V	-6.46	65.85	94	28.15
2373.32	53.03	PK	174	2.1	H	-6.46	46.57	74	27.43
2373.32	32.06	Ave.	174	2.1	H	-6.46	25.60	54	28.40
2400.00	61.98	PK	329	1.9	H	-6.46	55.52	74	18.48
2400.00	42.74	Ave.	329	1.9	H	-6.46	36.28	54	17.72
2483.59	60.71	PK	308	1.1	H	-4.74	55.97	74	18.03
2483.59	32.33	Ave.	308	1.1	H	-4.74	27.59	54	26.41
2484.12	59.35	PK	47	1.4	H	-4.74	54.61	74	19.39
2484.12	31.54	Ave.	47	1.4	H	-4.74	26.80	54	27.20
4890.00	60.07	PK	103	2.5	H	3.56	63.63	74	10.37
4890.00	38.71	Ave.	103	2.5	H	3.56	42.27	54	11.73
7335.00	44.31	PK	282	1.6	V	10.11	54.42	74	19.58
7335.00	26.57	Ave.	282	1.6	V	10.11	36.68	54	17.32
9780.00	43.15	PK	46	2.0	H	13.21	56.36	74	17.64
9780.00	23.06	Ave.	46	2.0	H	13.21	36.27	54	17.73

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.249/15.205/15.209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2475 MHz)									
384.13	51.35	QP	288	1.5	H	-11.1	40.25	46	5.75
2475.00	104.62	PK	34	1.9	H	-4.74	99.88	114	14.12
2475.00	83.49	Ave.	34	1.9	H	-4.74	78.75	94	15.25
2475.00	95.39	PK	273	1.7	V	-4.74	90.65	114	23.35
2475.00	74.21	Ave.	273	1.7	V	-4.74	69.47	94	24.53
2378.69	50.91	PK	239	1.9	H	-6.46	44.45	74	29.55
2378.69	31.81	Ave.	239	1.9	H	-6.46	25.35	54	28.65
2400.00	59.47	PK	34	1.9	H	-4.74	54.73	74	19.27
2400.00	40.93	Ave.	34	1.9	H	-4.74	36.19	54	17.81
2483.51	75.69	PK	139	1.8	H	-4.74	70.95	74	3.05
2483.51	34.69	Ave.	139	1.8	H	-4.74	29.95	54	24.05
2484.06	75.05	PK	332	2.1	H	-4.74	70.31	74	3.69
2484.06	34.11	Ave.	332	2.1	H	-4.74	29.37	54	24.63
4950.00	61.75	PK	18	2.0	H	3.19	64.94	74	9.06
4950.00	40.71	Ave.	18	2.0	H	3.19	43.90	54	10.10
7425.00	43.76	PK	294	1.3	H	8.17	51.93	74	22.07
7425.00	25.44	Ave.	294	1.3	H	8.17	33.61	54	20.39
9900.00	42.69	PK	277	2.2	H	13.21	55.90	74	18.10
9900.00	22.76	Ave.	277	2.2	H	13.21	35.97	54	18.03

**Note:**

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor

Margin = Limit- Corr. Amplitude

**FCC§15.215(c) - 20dB EMISSION BANDWIDTH****Applicable Standard**

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

**Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that indicated 20dB bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2016-12-11
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-23
Ducommun technologies	RF Cable	RG-214	1	2015-06-15	2016-06-15
Ducommun technologies	RF Cable	RG-214	2	2015-06-15	2016-06-15

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).



**Test Data****Environmental Conditions**

<b>Temperature:</b>	20 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.0 kPa

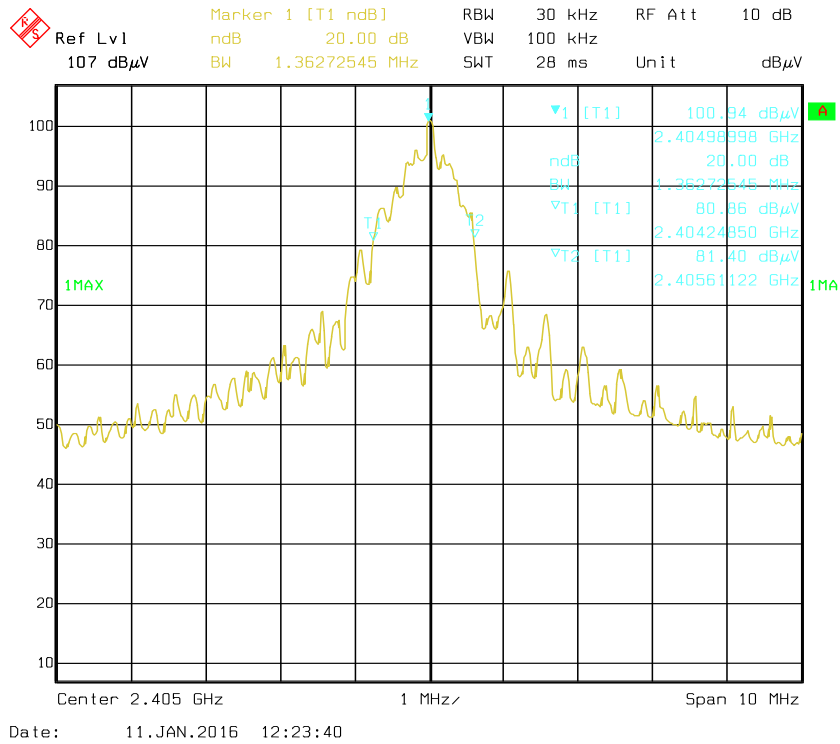
*The testing was performed by Hill He on 2016-01-11.*

*Test Mode: Transmitting*

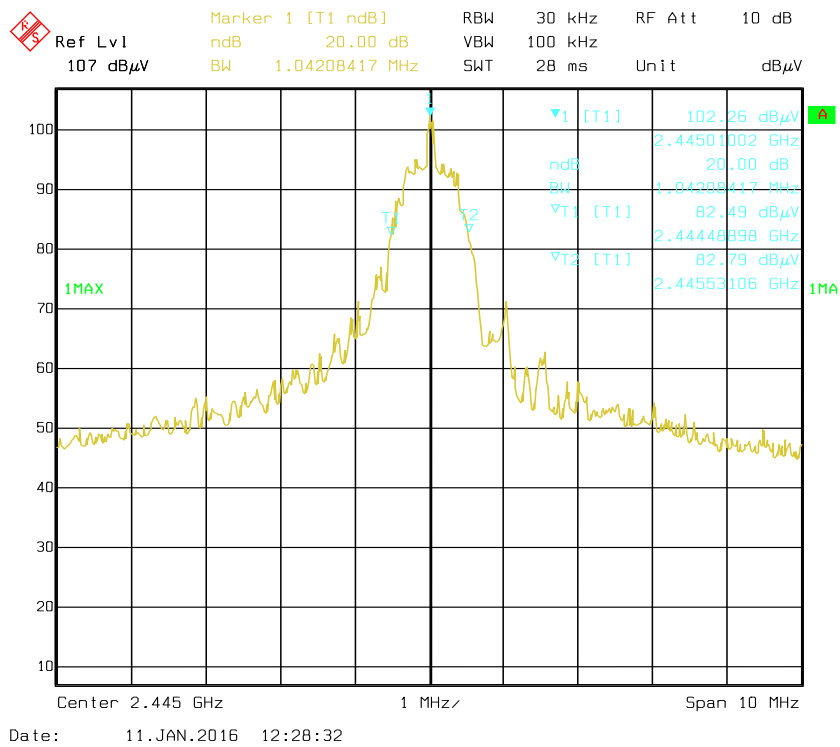
*Please refer to the following table and plots.*

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>20dB Bandwidth (MHz)</b>
Low	2405	1.363
Middle	2445	1.042
High	2475	1.082

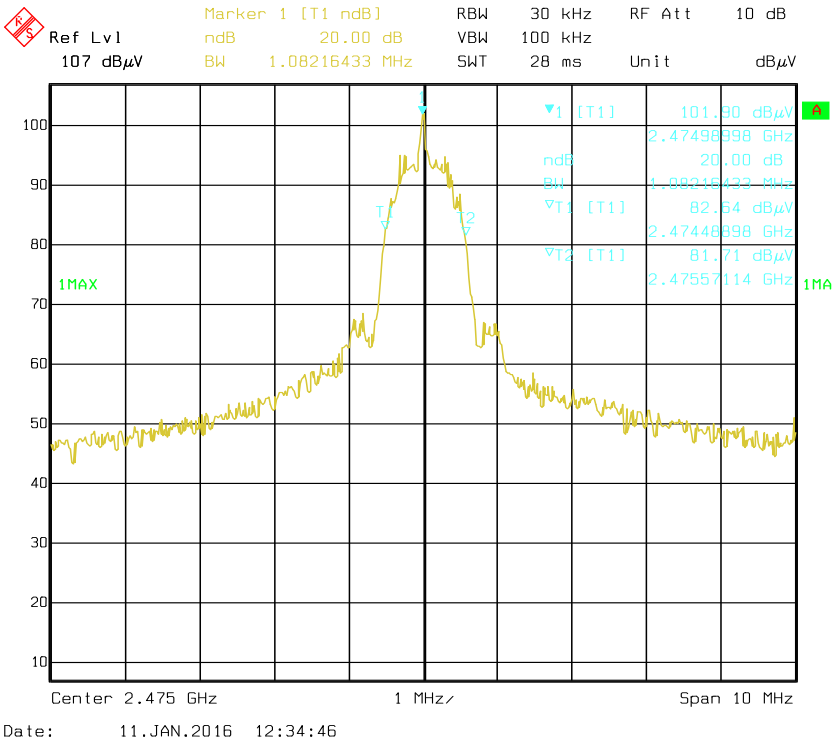
### Low Channel



### Middle Channel



High Channel



\*\*\*\*\* END OF REPORT \*\*\*\*\*