

## **Certification Test Report**

**FCC ID: 2ADDK360FLY4K**  
**IC: 12404A-360FLY4K**

**FCC Rule Part: 15.247**  
**IC Radio Standards Specification: RSS-247**

**ACS Report Number: 16-2006.W06.1A**

Manufacturer: 360fly, Inc.  
Model(s): 360FLY4K

Test Begin Date: **February 12, 2016**  
Test End Date: **March 2, 2016**

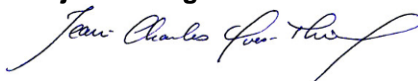
Report Issue Date: April 7, 2016



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, ANSI, or any agency of the Federal Government.

**Project Manager:**

A handwritten signature in blue ink that reads "Thierry Jean-Charles".

**Thierry Jean-Charles**  
**EMC Engineer**  
**Advanced Compliance Solutions, Inc.**

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**This report contains 18 pages**

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## 1 GENERAL

### 1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-247.

### 1.2 Product Description

The product 360FLY4K is a camera which includes a single transceiver that supports GPS, Bluetooth 3.0/4.0 and Wi-Fi 2.4/5GHz bands. The function of the transceiver is to communicate with smart phones or tablet over Bluetooth and Wi-Fi using custom application. The custom application allows users to change the camera settings, capture pictures, record videos, share media and edit videos using Wi-Fi connection. This test report document results for the Bluetooth 3.0+EDR radio.

#### Technical Details

Mode of Operation:	Bluetooth 3.0 + Enhanced Data Rate (EDR)
Frequency Range:	2402 MHz - 2480 MHz
Number of Channels:	79
Channel Separation:	1 MHz
Modulations:	GFSK, $\pi/4$ -DQPSK, 8DPSK
TX Data Rates:	GFSK: 1Mbps $\pi/4$ -DQPSK: 2Mbps 8DPSK: 3Mbps
Antenna Type/Gain:	Loop Antenna, 0.03 dBi

### 1.3 Manufacturer Information

360fly, Inc.  
1000 Town Center Way, Suite 200  
Canonsburg, PA 15317

Model Number: 360FLY4K

Test Sample Serial Number(s): PIB179 (Radiated & Power Line Conducted Emissions)

Test Sample Condition: The samples were in good conditions with no observable physical damages.

#### 1.4 Test Methodology and Considerations

The EUT was evaluated for radiated and power line conducted emissions for the Bluetooth radio. The RF conducted measurements were performed by a different test facility which documented the results in a separate test report.

For the radiated emission evaluation, preliminary evaluation was performed for the EUT standalone, the EUT powered via a power supply and the EUT connected to a laptop computer. The radiated emissions from the three configurations did not differ significantly and the final measurements were collected using the laptop configuration.

The power line conducted emissions evaluation was performed for the EUT powered using a wall adapter. Preliminary evaluations were performed for all the modulations. The results are reported for the worst case.

**Table 1.4-1: Bluetooth Radio Test configuration**

Mode of Operations	Frequency (MHz)	Data Rate (kbps)
GFSK	2402	1000
	2441	1000
	2480	1000
$\pi/4$ DQPSK	2402	2000
	2441	2000
	2480	2000
8 DPSK	2402	3000
	2441	3000
	2480	3000

The EUT was also evaluated for unintentional emissions. The results are documented separately in a Declaration of Conformity/Verification test report.

## **2 TEST FACILITIES**

### **2.1 Location**

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.  
3998 FAU Blvd, Suite 310  
Boca Raton, Florida 33431  
Phone: (561) 961-5585  
Fax: (561) 961-5587  
[www.acstestlab.com](http://www.acstestlab.com)

FCC Test Firm Registration #: 475089  
Industry Canada Lab Code: 4175C

### **2.2 Laboratory Accreditations/Recognitions/Certifications**

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ANAB program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

## 2.3 Radiated & Conducted Emissions Test Site Description

### 2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

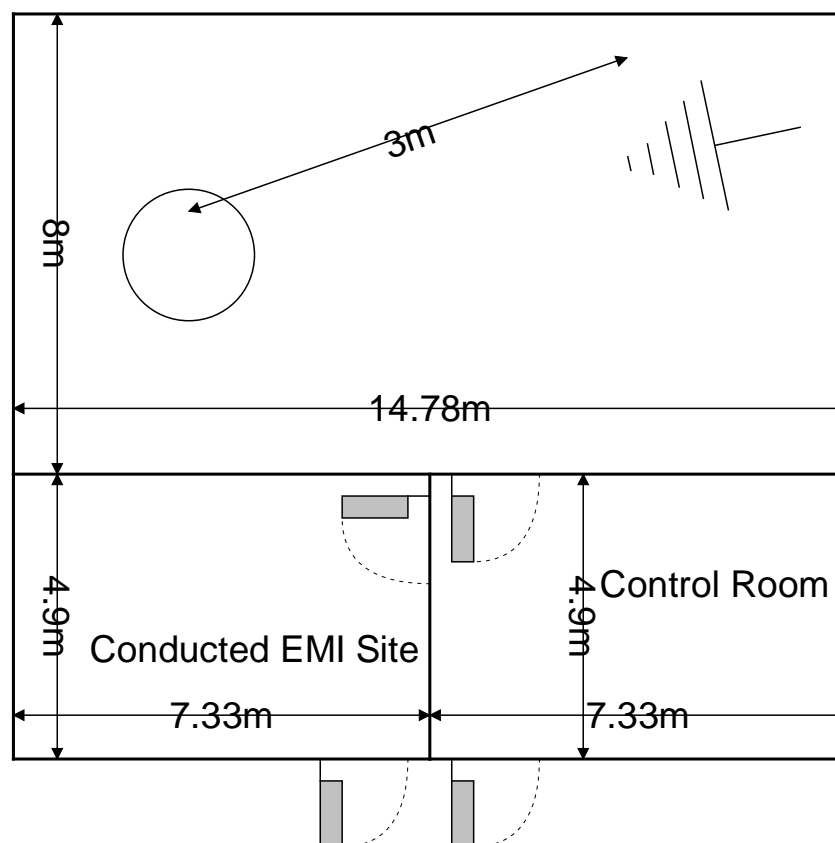


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

### 2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m<sup>3</sup>. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50  $\Omega$ /50  $\mu$ H and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

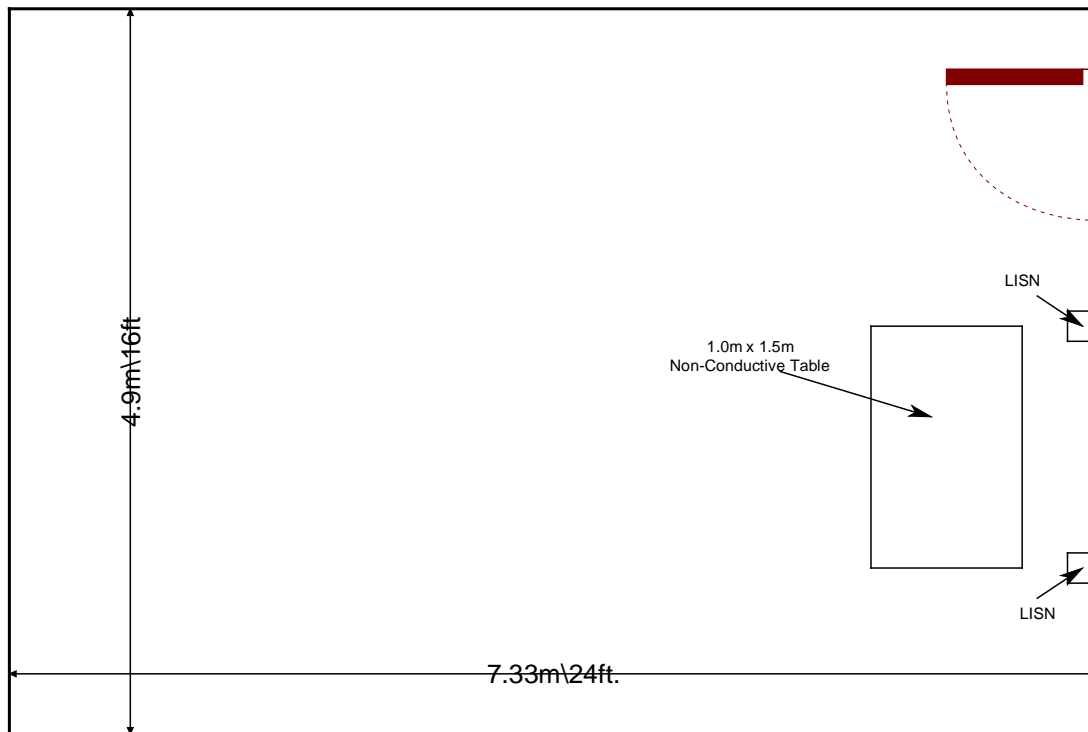


Figure 2.3.2-1: AC Mains Conducted EMI Site

### **3 APPLICABLE STANDARD REFERENCES**

The following standards were used:

- ❖ ANSI C63.4-2014: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 40 GHz.
- ❖ ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2016.
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2016
- ❖ Industry Canada Radio Standards Specification: RSS-247 — Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 1, May 2015.
- ❖ Industry Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, November 2014.



#### 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment List**

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
479	Electro-Metrics	ALP-70	Antennas	158	12/3/2015	12/3/2017
523	Agilent	E7405	Spectrum Analyzers	MY45103293	12/26/2014	12/26/2016
653	Suhner	SF-102A	Cables	0944/2A	4/13/2015	4/13/2016
2002	EMCO	3108	Antennas	2147	11/19/2015	11/19/2017
2004	EMCO	3146	Antennas	1385	11/19/2015	11/19/2017
2006	EMCO	3115	Antennas	2573	4/14/2015	4/14/2017
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	11/18/2015	11/18/2016
2022	EMCO	LISN3825/2R	LISN	1095	9/14/2015	9/14/2017
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	11/11/2015	11/11/2016
2070	Mini Circuits	VHF-8400+	Filter	2070	11/17/2015	11/17/2016
2072	Mini Circuits	VHF-3100+	Filter	30737	11/17/2015	11/17/2016
2075	Hewlett Packard	8495B	Attenuators	2626A11012	11/18/2015	11/18/2016
2082	Teledyne Storm Products	90-010-048	Cables	2082	4/22/2015	4/22/2016
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	11/16/2015	11/16/2016
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/9/2015	12/9/2016
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
2121	ACS Boca	Radiated Cable Set	Cable Set	2121	8/22/2015	8/22/2016
3004	Teseq	CFL 9206A	Attenuators	34720	10/7/2015	10/7/2016

**Note: NCR=No Calibration Required**

## 5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment (Radiated Emissions)

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	360fly, Inc.	360FLY4K	PIB179
2	Dock	360fly, Inc.	360FLYBLK	N/A
3	Laptop	Apple, Inc	Macbook Pro A1278	C1MN2X3DTY3
4	Mouse	Dell	M-UARDEL7	LZ9440C43W5
5	Laptop AC Adapter	Apple, Inc	MagSafe	N/A
6	Earbuds	Maxell	N/A	N/A

Table 5-2: Cable Description (Radiated Emissions)

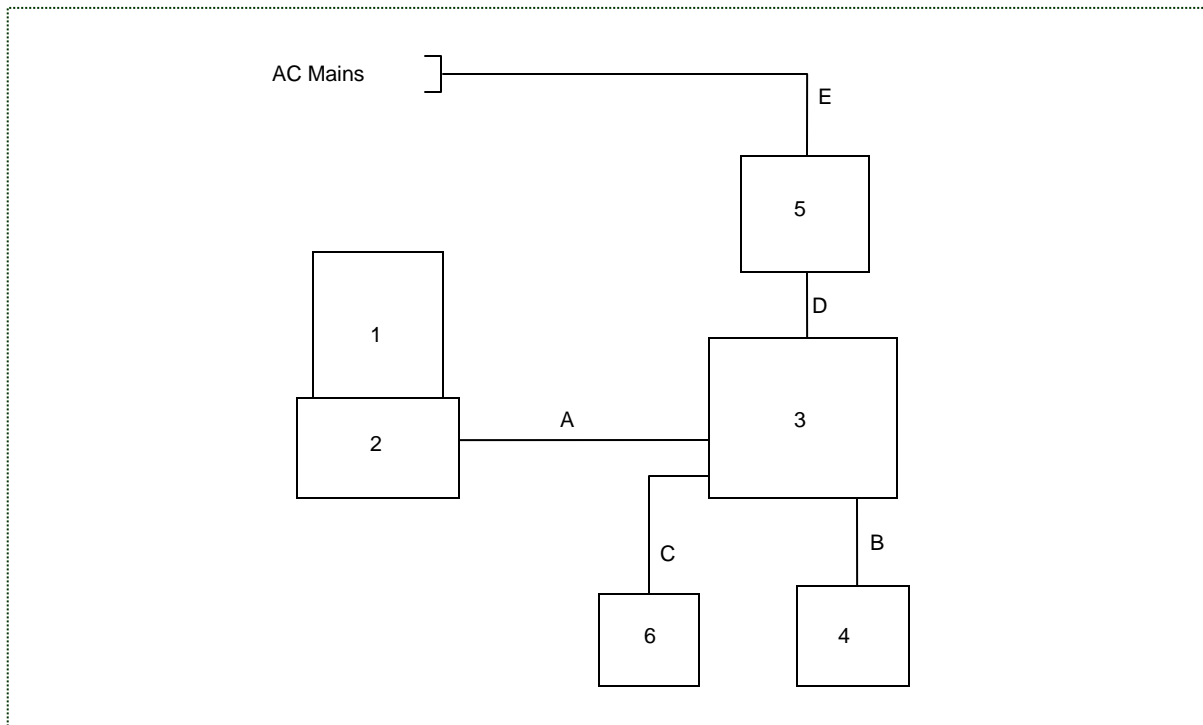
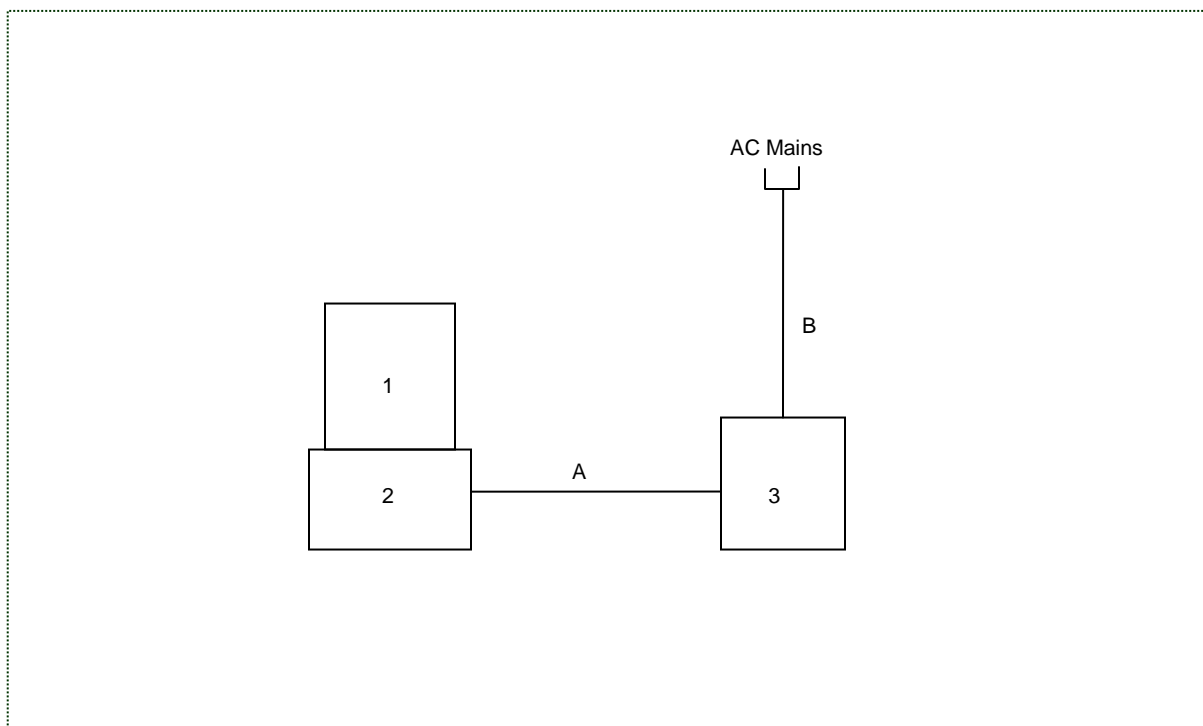
Cable #	Cable Type	Length	Shield	Termination
A	USB	0.56 m	No	EUT Dock to Laptop
B	USB	1.80 m	No	Mouse to Laptop
C	Audio	0.95 m	No	Laptop to Earbuds
D	Power	1.80 m	No	Laptop to AC Adapter
	Extension Cord	2.7 m	No	Laptop Adapter to AC Mains

Table 5-3: EUT and Support Equipment (Power Line Conducted Emissions)

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	360fly, Inc.	360FLY4K	PIB179
2	Dock	360fly, Inc.	360FLYBLK	N/A
3	5 VDC Wall AC Adapter	VSN	C-P06	141125011054

Table 5-4: Cable Description (Power Line Conducted Emissions)

Cable #	Cable Type	Length	Shield	Termination
A	USB	0.56 m	No	EUT Dock to Wall AC Adapter
B	Extension Cord	2.7 m	No	AC Adapter to AC Mains

**6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM****Figure 6-1: EUT Test Setup (Radiated Emissions)****Figure 6-2: EUT Test Setup (Power Line Conducted Emissions)**

## 7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

### 7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses an internal 0.03 dBi loop antenna which connects to the PCB via spring contact. The antenna meets the requirements of FCC Section 15.203.

### 7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 8.8

#### 7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

$$\begin{aligned}\text{Corrected Reading} &= \text{Analyzer Reading} + \text{LISN Loss} + \text{Cable Loss} \\ \text{Margin} &= \text{Applicable Limit} - \text{Corrected Reading}\end{aligned}$$

#### 7.2.2 Measurement Results

Results of the test corresponding to the EUT configuration leading to the worse case emissions are shown below:

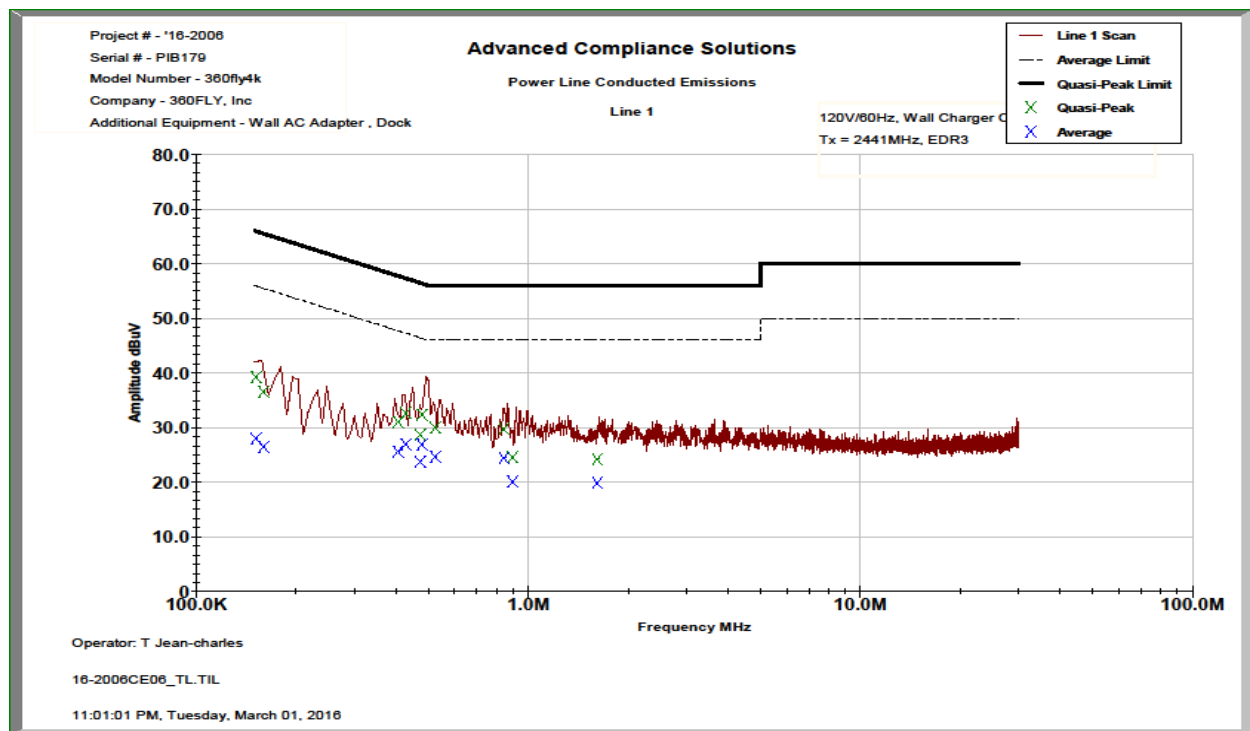


Figure 7.2.2-1: Conducted Emissions Results – Line 1

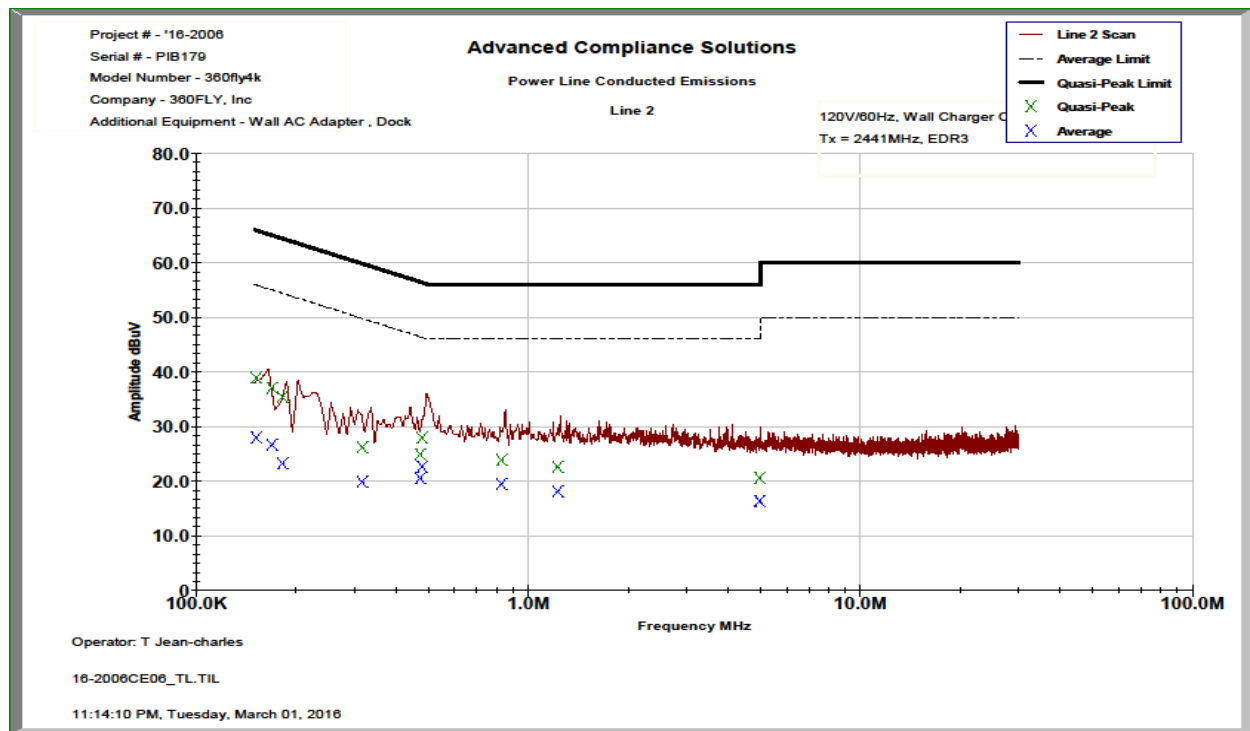


Figure 7.2.2-2: Conducted Emissions Results – Line 2

Table 7.2.2-1: Conducted EMI Results

☒ Line 1
☒ Line 2
☐ Line 3

☐ Line 4

☐ To Ground
☒ Floating

☐ Telecom Port \_\_\_\_\_

☒ dBµV
☐ dBµA

Plot Number: 16-2006CE06

Power Supply Description: 5 VDC

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.151742	29.005	17.763	10.22	39.23	27.99	65.90	55.90	26.7	27.9
0.15985	26.326	16.271	10.22	36.55	26.49	65.47	55.47	28.9	29.0
0.406112	20.843	15.38	10.21	31.06	25.59	57.73	47.73	26.7	22.1
0.4285	22.428	16.701	10.21	32.64	26.91	57.28	47.28	24.6	20.4
0.473274	18.471	13.55	10.21	28.68	23.76	56.46	46.46	27.8	22.7
0.48	22.174	16.701	10.21	32.38	26.91	56.34	46.34	24.0	19.4
0.525512	19.742	14.452	10.20	29.95	24.66	56.00	46.00	26.1	21.3
0.8464	19.56	14.255	10.19	29.75	24.44	56.00	46.00	26.3	21.6
0.898638	14.376	9.901	10.19	24.57	20.09	56.00	46.00	31.4	25.9
1.61504	13.978	9.636	10.20	24.18	19.84	56.00	46.00	31.8	26.2
Line 2									
0.152029	28.69	17.749	10.23	38.92	27.98	65.89	55.89	27.0	27.9
0.169363	26.897	16.486	10.23	37.13	26.72	64.99	54.99	27.9	28.3
0.182237	25.23	13.01	10.22	35.45	23.23	64.38	54.38	28.9	31.1
0.316563	15.977	9.664	10.21	26.19	19.88	59.80	49.80	33.6	29.9
0.473275	14.744	10.347	10.21	24.95	20.56	56.46	46.46	31.5	25.9
0.479999	17.769	12.484	10.21	27.98	22.69	56.34	46.34	28.4	23.6
0.831475	13.686	9.304	10.21	23.89	19.51	56.00	46.00	32.1	26.5
1.22699	12.342	7.939	10.25	22.59	18.19	56.00	46.00	33.4	27.8
4.98	10.093	5.859	10.44	20.54	16.30	56.00	46.00	35.5	29.7
4.9801	10.082	5.911	10.44	20.52	16.35	56.00	46.00	35.5	29.6

### 7.3 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC: RSS-247 5.5

#### 7.3.1 Radiated Spurious Emissions within the Restricted Bands - FCC Sections 15.205, 15.209; IC: RSS-Gen 8.9, 8.10

##### 7.3.1.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 26 GHz, 10 times the highest fundamental frequency. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

For measurements below 30 MHz, the receive antenna height was set to 1m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

For measurements above 30 MHz, the EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively. Average measurements were collected in the linear amplitude scale with VBW of 30 Hz.

The EUT was caused to generate a continuous carrier signal on the hopping channel.

##### 7.3.1.2 Measurement Results

Band-edge and radiated spurious emissions found in the restricted bands of 9 kHz to 26 GHz are reported in the tables below.

**Table 7.3.1.2-1: Radiated Spurious Emissions Tabulated Data - GFSK**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (2402 MHz)										
4804	43.27	32.68	H	2.92	46.19	35.60	74.0	54.0	27.8	18.4
4804	43.35	32.25	V	2.92	46.27	35.17	74.0	54.0	27.7	18.8
Middle Channel (2441 MHz)										
4882	42.18	31.70	H	3.19	45.37	34.89	74.0	54.0	28.6	19.1
4882	42.86	31.83	V	3.19	46.05	35.02	74.0	54.0	28.0	19.0
7323	43.04	32.23	H	8.85	51.89	41.08	74.0	54.0	22.1	12.9
7323	42.74	31.76	V	8.85	51.59	40.61	74.0	54.0	22.4	13.4
High Channel (2480 MHz)										
2483.5	59.33	50.24	H	-5.15	54.18	45.09	74.0	54.0	19.8	8.9
2483.5	59.42	52.76	V	-5.15	54.27	47.61	74.0	54.0	19.7	6.4
4960	42.35	31.54	H	3.46	45.81	35.00	74.0	54.0	28.2	19.0
4960	42.80	32.23	V	3.46	46.26	35.69	74.0	54.0	27.7	18.3

**Note:** All emissions above 7.323 GHz were attenuated below the limits and the noise floor of the measurement equipment.

Table 7.3.1.2-2: Radiated Spurious Emissions Tabulated Data – ( $\pi/4$ ) DQPSK

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (2402 MHz)										
4804	43.17	32.32	H	2.92	46.09	35.24	74.0	54.0	27.9	18.8
4804	43.74	32.32	V	2.92	46.66	35.24	74.0	54.0	27.3	18.8
Middle Channel (2441 MHz)										
4882	42.49	31.73	V	3.19	45.68	34.92	74.0	54.0	28.3	19.1
7323	42.50	31.51	H	8.85	51.35	40.36	74.0	54.0	22.6	13.6
High Channel (2480 MHz)										
2483.5	58.68	50.07	H	-5.15	53.53	44.92	74.0	54.0	20.5	9.1
2483.5	59.11	52.39	V	-5.15	53.96	47.24	74.0	54.0	20.0	6.8
4960	42.84	31.82	V	3.46	46.30	35.28	74.0	54.0	27.7	18.7

Note: All emissions above 7.323 GHz were attenuated below the limits and the noise floor of the measurement equipment.

Table 7.3.1.2-3: Radiated Spurious Emissions Tabulated Data – 8DPSK

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel (2402 MHz)										
4804	43.74	32.32	H	2.92	46.66	35.24	74.0	54.0	27.3	18.8
4804	43.66	32.46	V	2.92	46.58	35.38	74.0	54.0	27.4	18.6
Middle Channel (2441 MHz)										
Noise Floor										
High Channel (2480 MHz)										
2483.5	58.20	49.92	H	-5.15	53.05	44.77	74.0	54.0	21.0	9.2
2483.5	59.12	51.59	V	-5.15	53.97	46.44	74.0	54.0	20.0	7.6

Note: All emissions above 4.804 GHz were attenuated below the limits and the noise floor of the measurement equipment.



**7.3.1.3 Sample Calculation:**

$$R_C = R_U + CF_T$$

Where:

$CF_T$	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
$R_U$	=	Uncorrected Reading
$R_C$	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

**Example Calculation: Peak**

Corrected Level:  $43.27 + 2.92 = 46.19$  dB $\mu$ V/m

Margin:  $74$  dB $\mu$ V/m –  $46.19$  dB $\mu$ V/m =  $27.8$  dB

**Example Calculation: Average**

Corrected Level:  $32.68 + 2.92 = 35.6$  dB $\mu$ V/m

Margin:  $54$  dB $\mu$ V/m –  $35.6$  dB $\mu$ V/m =  $18.4$  dB

**8 CONCLUSION**

In the opinion of ACS, Inc., the model 360FLY4K manufactured by 360fly, Inc. meet the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-247 for the test procedures documented in the test report.

**END REPORT**