

# RF Exposure Evaluation

## FCC ID: 2ABES-PILOTX01

### 1. Client Information

|                     |   |                                                                                                                                                         |
|---------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>    | : | Pathway Innovations and Technologies, Inc.                                                                                                              |
| <b>Address</b>      | : | 9985 Pacific Heights Blvd., Suite 100 San Diego, CA 92121, USA                                                                                          |
| <b>Manufacturer</b> | : | ShenZhen KerunVisual Technology Co., LTD.                                                                                                               |
| <b>Address</b>      | : | Unit A, F/11, Bldg.1, Senyang Electronic Technology Park, Tianliao Community, Guangming High Tech Zone, Guangming New District, Shenzhen, China 518132. |

### 2. General Description of EUT

|                               |   |                                                                                                                                                                                                            |
|-------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT Name</b>               | : | PilotX Tablet                                                                                                                                                                                              |
| <b>Models No.</b>             | : | KR2102, PilotX Tablet, PilotX, PilotS, PilotY, PilotZ, PilotV                                                                                                                                              |
| <b>Model Difference</b>       | : | All these models are the same PCB, layout and electrical circuit, the only difference is model name.                                                                                                       |
| <b>Product Description</b>    | : | <b>Operation Frequency:</b><br>2.4G:<br>802.11b/g/n(HT20): 2412MHz~2462MHz<br>Bluetooth 4.2(BLE): 2402MHz~2480MHz<br>5G:<br>U-NII-1: 5180MHz~5240MHz                                                       |
|                               | : | <b>Modulation Type:</b><br>802.11b: DSSS(CCK, DQPSK, DBPSK)<br>802.11g/n: OFDM(BPSK,QPSK,16QAM, 64QAM)<br>802.11a: OFDM (QPSK, BPSK, 16QAM)<br>802.11ac: OFDM (QPSK, BPSK, 16QAM, 64QAM, 256QAM) BLE: GFSK |
| <b>Power Supply</b>           | : | Input: DC 10-15V, 4A<br>DC 7.4V by 10000mAh Li-ion battery                                                                                                                                                 |
| <b>Software Version</b>       | : | win10                                                                                                                                                                                                      |
| <b>Hardware Version</b>       | : | V0.8                                                                                                                                                                                                       |
| <b>Connecting I/O Port(S)</b> | : | Please refer to the User's Manual                                                                                                                                                                          |
| <b>Remark</b>                 | : | The adapter and antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.                                                                                 |

**Note:** More test information about the EUT please refer the RF Test Report.

## SAR Test Exclusion Calculations

1. FCC: According to KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies v06.

- (1) Clause 4.3: General SAR test reduction and exclusion guidance

- Sub clause 4.31: Standalone SAR test exclusion considerations

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6GHz at test separation distance  $\leq 5$  mm are determined by:

- $$\frac{[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation, mm})] * [\sqrt{f_{\text{(GHz)}}}] \leq 3.0 \text{ for 1-g SAR}$$

- $$\frac{[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation, mm})] * [\sqrt{f_{\text{(GHz)}}}] \leq 7.5.0 \text{ for 10-g SAR}$$

## 2. Evaluation Result

### 2.1 Conducted Power

#### [2.4GHz Bluetooth]

| Mode | Channel | Frequency | Average Conducted Output Power (dBm) |           |
|------|---------|-----------|--------------------------------------|-----------|
|      |         |           | Antenna A                            | Antenna B |
| BLE  | 00      | 2402      | 0.068                                | -0.429    |
|      | 20      | 2442      | 0.122                                | -0.210    |
|      | 39      | 2480      | -0.631                               | -0.745    |

#### [2.4GHz WLAN]

| Mode              | Channel | Frequency | Average Conducted Output Power (dBm) |           |
|-------------------|---------|-----------|--------------------------------------|-----------|
|                   |         |           | Antenna A                            | Antenna B |
| IEEE 802.11b      | 1       | 2412      | 7.16                                 | 7.15      |
|                   | 7       | 2437      | 7.10                                 | 7.12      |
|                   | 13      | 2462      | 7.11                                 | 7.14      |
| IEEE 802.11g      | 1       | 2412      | 6.49                                 | 6.41      |
|                   | 7       | 2437      | 6.88                                 | 6.69      |
|                   | 13      | 2462      | 6.41                                 | 6.46      |
| IEEE 802.11n HT20 | 1       | 2412      | 2.67                                 | 2.56      |
|                   | 7       | 2437      | 2.28                                 | 2.72      |
|                   | 13      | 2462      | 2.59                                 | 2.61      |

#### [5GHz WLAN Band 1]

| Mode                | Channel | Frequency | Average Conducted Output Power (dBm) |           |
|---------------------|---------|-----------|--------------------------------------|-----------|
|                     |         |           | Antenna A                            | Antenna B |
| IEEE 802.11a        | 36      | 5180      | 6.44                                 | 6.23      |
|                     | 40      | 5200      | 6.34                                 | 6.31      |
|                     | 48      | 5240      | 6.25                                 | 6.35      |
| IEEE 802.11n HT20   | 36      | 5180      | 3.10                                 | 3.20      |
|                     | 40      | 5200      | 3.13                                 | 3.00      |
|                     | 48      | 5240      | 3.39                                 | 3.23      |
| IEEE 802.11ac VHT20 | 36      | 5180      | 3.21                                 | 3.23      |
|                     | 40      | 5200      | 3.18                                 | 3.18      |
|                     | 48      | 5240      | 3.19                                 | 3.17      |
| IEEE 802.11n HT40   | 38      | 5190      | 2.27                                 | 2.27      |
|                     | 46      | 5230      | 2.27                                 | 2.25      |
| IEEE 802.11ac VHT40 | 38      | 5190      | 2.23                                 | 2.28      |
|                     | 46      | 5230      | 2.26                                 | 2.24      |
| IEEE 802.11ac VHT80 | 42      | 5210      | 1.27                                 | 1.29      |

**2.2 Manufacturing Tolerance**

| 2.4GHz Bluetooth(BLE)                |           |      |           |           |      |      |
|--------------------------------------|-----------|------|-----------|-----------|------|------|
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 2402      | 2442 | 2480      | 2402      | 2442 | 2480 |
| Target (dBm)                         | 0.0       | 0.0  | 0.0       | 0.0       | 0.0  | 0.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 2.4GHz WLAN IEEE 802.11b             |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 2412      | 2437 | 2462      | 2412      | 2437 | 2462 |
| Target (dBm)                         | 7.0       | 7.0  | 7.0       | 7.0       | 7.0  | 7.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 2.4GHz WLAN IEEE 802.11g             |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 2412      | 2437 | 2462      | 2412      | 2437 | 2462 |
| Target (dBm)                         | 6.0       | 6.0  | 6.0       | 6.0       | 6.0  | 6.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 2.4GHz WLAN IEEE 802.11n HT20        |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 2412      | 2437 | 2462      | 2412      | 2437 | 2462 |
| Target (dBm)                         | 2.0       | 2.0  | 2.0       | 2.0       | 2.0  | 2.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 5GHz WLAN Band 1 IEEE 802.11a        |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 5180      | 5200 | 5240      | 5180      | 5200 | 5240 |
| Target (dBm)                         | 6.0       | 6.0  | 6.0       | 6.0       | 6.0  | 6.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 5GHz WLAN Band 1 IEEE 802.11 n HT20  |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 5180      | 5200 | 5240      | 5180      | 5200 | 5240 |
| Target (dBm)                         | 3.0       | 3.0  | 3.0       | 3.0       | 3.0  | 3.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 5GHz WLAN Band 1 IEEE 802.11ac VHT20 |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      |           | Antenna B |      |      |
|                                      | 5180      | 5200 | 5240      | 5180      | 5200 | 5240 |
| Target (dBm)                         | 3.0       | 3.0  | 3.0       | 3.0       | 3.0  | 3.0  |
| Tolerance ± (dB)                     | 1.0       | 1.0  | 1.0       | 1.0       | 1.0  | 1.0  |
| 5GHz WLAN Band 1 IEEE 802.11n HT40   |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      | Antenna B |           |      |      |
|                                      | 5190      | 5230 | 5190      |           | 5230 |      |
| Target (dBm)                         | 2.0       |      | 2.0       |           | 2.0  |      |
| Tolerance ± (dB)                     | 1.0       |      | 1.0       |           | 1.0  |      |
| 5GHz WLAN Band 1 IEEE 802.11ac VHT40 |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      | Antenna B |           |      |      |
|                                      | 5190      | 5230 | 5190      |           | 5230 |      |
| Target (dBm)                         | 2.0       |      | 2.0       |           | 2.0  |      |
| Tolerance ± (dB)                     | 1.0       |      | 1.0       |           | 1.0  |      |
| 5GHz WLAN Band 1 IEEE 802.11ac VHT80 |           |      |           |           |      |      |
| Frequency (MHz)                      | Antenna A |      | Antenna B |           |      |      |
|                                      | 5210      |      | 5210      |           |      |      |
| Target (dBm)                         | 1.0       |      | 1.0       |           |      |      |
| Tolerance ± (dB)                     | 1.0       |      | 1.0       |           |      |      |

## 2.3 Standalone MPE

## 2.4GHz Bluetooth Antenna A

| MODE | f (GHz) | Minimum Separation Distance (mm) | Output Power (Turn-up Procedure) |      | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion | Estimation Standalone SAR (W/kg) |
|------|---------|----------------------------------|----------------------------------|------|------------------|---------------------|--------------------|----------------------------------|
|      |         |                                  | dBm                              | mW   |                  |                     |                    |                                  |
| BLE  | 2.402   | 5                                | 1.0                              | 1.26 | 0.390            | 3.0                 | YES                | 0.520                            |
|      | 2.442   | 5                                | 1.0                              | 1.26 | 0.393            | 3.0                 | YES                | 0.525                            |
|      | 2.480   | 5                                | 1.0                              | 1.26 | 0.397            | 3.0                 | YES                | 0.529                            |

## 2.4GHz Bluetooth Antenna A

| MODE | f (GHz) | Minimum Separation Distance (mm) | Output Power (Turn-up Procedure) |      | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion | Estimation Standalone SAR (W/kg) |
|------|---------|----------------------------------|----------------------------------|------|------------------|---------------------|--------------------|----------------------------------|
|      |         |                                  | dBm                              | mW   |                  |                     |                    |                                  |
| BLE  | 2.402   | 5                                | 1.0                              | 1.26 | 0.390            | 3.0                 | YES                | 0.520                            |
|      | 2.442   | 5                                | 1.0                              | 1.26 | 0.393            | 3.0                 | YES                | 0.525                            |
|      | 2.480   | 5                                | 1.0                              | 1.26 | 0.397            | 3.0                 | YES                | 0.529                            |

## 2.4GHz WLAN Antenna A

| MODE           | f (GHz) | Minimum Separation Distance (mm) | Output Power (Turn-up Procedure) |      | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion | Estimation Standalone SAR (W/kg) |
|----------------|---------|----------------------------------|----------------------------------|------|------------------|---------------------|--------------------|----------------------------------|
|                |         |                                  | dBm                              | mW   |                  |                     |                    |                                  |
| 802.11b        | 2.412   | 5                                | 8.0                              | 6.31 | 1.960            | 3.0                 | YES                | 0.2613                           |
|                | 2.437   | 5                                | 8.0                              | 6.31 | 1.970            | 3.0                 | YES                | 0.2650                           |
|                | 2.462   | 5                                | 8.0                              | 6.31 | 1.980            | 3.0                 | YES                | 0.2640                           |
| 802.11g        | 2.412   | 5                                | 7.0                              | 5.01 | 1.557            | 3.0                 | YES                | 0.2076                           |
|                | 2.437   | 5                                | 7.0                              | 5.01 | 1.565            | 3.0                 | YES                | 0.2086                           |
|                | 2.462   | 5                                | 7.0                              | 5.01 | 1.573            | 3.0                 | YES                | 0.2097                           |
| 802.11n (HT20) | 2.412   | 5                                | 3.0                              | 2.00 | 0.620            | 3.0                 | YES                | 0.0826                           |
|                | 2.437   | 5                                | 3.0                              | 2.00 | 0.623            | 3.0                 | YES                | 0.0831                           |
|                | 2.462   | 5                                | 3.0                              | 2.00 | 0.626            | 3.0                 | YES                | 0.0835                           |

## 2.4GHz WLAN Antenna B

| MODE           | f (GHz) | Minimum Separation Distance (mm) | Output Power (Turn-up Procedure) |      | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion | Estimation Standalone SAR (W/kg) |
|----------------|---------|----------------------------------|----------------------------------|------|------------------|---------------------|--------------------|----------------------------------|
|                |         |                                  | dBm                              | mW   |                  |                     |                    |                                  |
| 802.11b        | 2.412   | 5                                | 8.0                              | 6.31 | 1.960            | 3.0                 | YES                | 0.2613                           |
|                | 2.437   | 5                                | 8.0                              | 6.31 | 1.970            | 3.0                 | YES                | 0.2650                           |
|                | 2.462   | 5                                | 8.0                              | 6.31 | 1.980            | 3.0                 | YES                | 0.2640                           |
| 802.11g        | 2.412   | 5                                | 7.0                              | 5.01 | 1.557            | 3.0                 | YES                | 0.2076                           |
|                | 2.437   | 5                                | 7.0                              | 5.01 | 1.565            | 3.0                 | YES                | 0.2086                           |
|                | 2.462   | 5                                | 7.0                              | 5.01 | 1.573            | 3.0                 | YES                | 0.2097                           |
| 802.11n (HT20) | 2.412   | 5                                | 3.0                              | 2.00 | 0.620            | 3.0                 | YES                | 0.0826                           |
|                | 2.437   | 5                                | 3.0                              | 2.00 | 0.623            | 3.0                 | YES                | 0.0831                           |
|                | 2.462   | 5                                | 3.0                              | 2.00 | 0.626            | 3.0                 | YES                | 0.0835                           |

## 5.2GHz WLAN Antenna A

| MODE             | f (GHz) | Minimum Separation Distance (mm) | Output Power (Turn-up Procedure) |      | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion | Estimation Standalone SAR (W/kg) |
|------------------|---------|----------------------------------|----------------------------------|------|------------------|---------------------|--------------------|----------------------------------|
|                  |         |                                  | dBm                              | mW   |                  |                     |                    |                                  |
| 802.11a          | 5.180   | 5                                | 7.0                              | 5.01 | 2.281            | 3.0                 | YES                | 0.3042                           |
|                  | 5.200   | 5                                | 7.0                              | 5.01 | 2.286            | 3.0                 | YES                | 0.3048                           |
|                  | 5.240   | 5                                | 7.0                              | 5.01 | 2.295            | 3.0                 | YES                | 0.3059                           |
| 802.11n (HT20)   | 5.180   | 5                                | 4.0                              | 2.51 | 1.143            | 3.0                 | YES                | 0.1525                           |
|                  | 5.200   | 5                                | 4.0                              | 2.51 | 1.146            | 3.0                 | YES                | 0.1527                           |
|                  | 5.240   | 5                                | 4.0                              | 2.51 | 1.150            | 3.0                 | YES                | 0.1533                           |
| 802.11ac (VHT20) | 5.180   | 5                                | 4.0                              | 2.51 | 1.143            | 3.0                 | YES                | 0.1525                           |
|                  | 5.200   | 5                                | 4.0                              | 2.51 | 1.146            | 3.0                 | YES                | 0.1527                           |
|                  | 5.240   | 5                                | 4.0                              | 2.51 | 1.150            | 3.0                 | YES                | 0.1533                           |
| 802.11n (HT40)   | 5.190   | 5                                | 3.0                              | 2.00 | 0.909            | 3.0                 | YES                | 0.1212                           |
|                  | 5.230   | 5                                | 3.0                              | 2.00 | 0.913            | 3.0                 | YES                | 0.1217                           |
| 802.11ac (VHT40) | 5.190   | 5                                | 3.0                              | 2.00 | 0.909            | 3.0                 | YES                | 0.1212                           |
|                  | 5.230   | 5                                | 3.0                              | 2.00 | 0.913            | 3.0                 | YES                | 0.1217                           |
| 802.11ac (VHT80) | 5.210   | 5                                | 2.0                              | 1.58 | 0.724            | 3.0                 | YES                | 0.0965                           |

## 5.2GHz WLAN Antenna B

| MODE             | f (GHz) | Minimum Separation Distance (mm) | Output Power (Turn-up Procedure) |      | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion | Estimation Standalone SAR (W/kg) |
|------------------|---------|----------------------------------|----------------------------------|------|------------------|---------------------|--------------------|----------------------------------|
|                  |         |                                  | dBm                              | mW   |                  |                     |                    |                                  |
| 802.11a          | 5.180   | 5                                | 7.0                              | 5.01 | 2.281            | 3.0                 | YES                | 0.3042                           |
|                  | 5.200   | 5                                | 7.0                              | 5.01 | 2.286            | 3.0                 | YES                | 0.3048                           |
|                  | 5.240   | 5                                | 7.0                              | 5.01 | 2.295            | 3.0                 | YES                | 0.3059                           |
| 802.11n (HT20)   | 5.180   | 5                                | 4.0                              | 2.51 | 1.143            | 3.0                 | YES                | 0.1525                           |
|                  | 5.200   | 5                                | 4.0                              | 2.51 | 1.146            | 3.0                 | YES                | 0.1527                           |
|                  | 5.240   | 5                                | 4.0                              | 2.51 | 1.150            | 3.0                 | YES                | 0.1533                           |
| 802.11ac (VHT20) | 5.180   | 5                                | 4.0                              | 2.51 | 1.143            | 3.0                 | YES                | 0.1525                           |
|                  | 5.200   | 5                                | 4.0                              | 2.51 | 1.146            | 3.0                 | YES                | 0.1527                           |
|                  | 5.240   | 5                                | 4.0                              | 2.51 | 1.150            | 3.0                 | YES                | 0.1533                           |
| 802.11n (HT40)   | 5.190   | 5                                | 3.0                              | 2.00 | 0.909            | 3.0                 | YES                | 0.1212                           |
|                  | 5.230   | 5                                | 3.0                              | 2.00 | 0.913            | 3.0                 | YES                | 0.1217                           |
| 802.11ac (VHT40) | 5.190   | 5                                | 3.0                              | 2.00 | 0.909            | 3.0                 | YES                | 0.1212                           |
|                  | 5.230   | 5                                | 3.0                              | 2.00 | 0.913            | 3.0                 | YES                | 0.1217                           |
| 802.11ac (VHT80) | 5.210   | 5                                | 2.0                              | 1.58 | 0.724            | 3.0                 | YES                | 0.0965                           |

Remark:

1. Output power including tune up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

#### Simultaneous Transmission for SAR Exclusion

The sample supports 2 antennas for Bluetooth, 2.4GHz WLAN and 5G WLAN. The Antenna A is used for Bluetooth and 2.4G/5G WLAN, the Antenna B is used for Bluetooth and 2.4G/5G WLAN. they supports same antenna, need consider simultaneous transmission;

$$\sum \text{of (the highest measured or estimated SAR}_{\text{AntennaA}} + \text{SAR}_{\text{AntennaB}}) / 1.6 \\ = (0.529 + 0.529) / 1.6 = 0.51 < 1.0;$$

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