

# RF Exposure Evaluation Report

APPLICANT : Planet Avvio LLC  
EQUIPMENT : router  
BRAND NAME : Avvio  
MODEL NAME : RT400  
FCC ID : 2ALTART400X  
STANDARD : 47 CFR Part 2.1091  
FCC KDB 447498 D01 v06

We, Sporton International (Shenzhen) Inc., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.



Approved by: Mark Qu / Manager



**Sporton International (Shenzhen) Inc.**

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**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA852504	Rev. 01	Initial issue of report	Jun. 11, 2018



## **1. Administration Data**

### **1.1. Testing Laboratory**

Testing Laboratory	
Test Site	Sporton International (Shenzhen) Inc.
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	Planet Avvio LLC
Address	9725 NW 117th Ave., Medley, FL 33178, United States

Manufacturer	
Company Name	MeiG Smart Technology Co., Ltd
Address	#5 Lingxia Road, Fenghuang the 4th Industrial Park, Fuyong Street, Bao'an District, Shenzhen



## 2. Description of Equipment Under Test (EUT)

Product Feature & Specification			
EUT Type	router		
Brand Name	Avvio		
Model Name	RT400		
FCC ID	2ALTART400X		
IMEI Code	869715033008171		
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz		
Mode	GSM/GPRS/EGPRS AMP/RMC 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink is not supported) LTE: QPSK, 16QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80		
Antenna Type	WWAN : External PCB Antenna WLAN Ant.1: External PCB Antenna WLAN Ant.2: External PCB Antenna		
Antenna Function for Transmitter		Ant. 1	Ant. 2
	802.11 a/b/g/n/ac SISO	V	V
	802.11 a/b/g/n/ac MIMO	V	V
HW Version	SLT768_V1.03_PCB		
SW Version	SLT768-TAQ_1.0.5_EQ103		
EUT Stage	Production Unit		
Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.			

### **3. Maximum RF average output power among production units**

#### **<GSM>**

Mode	Burst Average Power (dBm)	
	GSM 850	GSM 1900
GSM 1 Tx slot	33.00	31.00
GPRS 1 Tx slot	33.00	31.00
GPRS 2 Tx slots	33.00	31.00
GPRS 3 Tx slots	32.50	30.50
GPRS 4 Tx slots	32.50	30.50
EDGE 1 Tx slot	27.00	26.50
EDGE 2 Tx slots	27.00	26.50
EDGE 3 Tx slots	27.00	26.50
EDGE 4 Tx slots	27.00	26.50

#### **<WCDMA>**

Mode	Average Power (dBm)	
	WCDMA Band II	WCDMA Band V
AMR 12.2Kbps	25.00	24.00
RMC 12.2Kbps	25.00	24.00
HSDPA Subtest-1	23.50	22.50
HSDPA Subtest-2	23.50	22.50
HSDPA Subtest-3	23.00	22.00
HSDPA Subtest-4	23.00	22.00
DC-HSDPA Subtest-1	23.50	22.50
DC-HSDPA Subtest-2	23.50	22.50
DC-HSDPA Subtest-3	23.00	22.00
DC-HSDPA Subtest-4	23.00	22.00
HSUPA Subtest-1	23.50	22.50
HSUPA Subtest-2	22.00	21.50
HSUPA Subtest-3	22.00	21.50
HSUPA Subtest-4	22.00	21.50
HSUPA Subtest-5	23.50	22.50

**<LTE>**

Average Power (dBm)						
Modulation	BW (MHz)	RB Size	Target MPR	LTE Band 4	LTE Band 12	LTE Band 41
QPSK	20	≤ 18	0	23.50	-	24.00
QPSK	20	> 18	0-1	22.50	-	23.00
16QAM	20	≤ 18	0-1	22.50	-	23.00
16QAM	20	> 18	0-2	21.50	-	22.00
QPSK	15	≤ 16	0	23.50	-	24.00
QPSK	15	> 16	0-1	22.50	-	23.00
16QAM	15	≤ 16	0-1	22.50	-	23.00
16QAM	15	> 16	0-2	21.50	-	22.00
QPSK	10	≤ 12	0	23.50	23.50	24.00
QPSK	10	> 12	0-1	22.50	22.50	23.00
16QAM	10	≤ 12	0-1	22.50	22.50	23.00
16QAM	10	> 12	0-2	21.50	21.50	22.00
QPSK	5	≤ 8	0	23.50	23.50	24.00
QPSK	5	> 8	0-1	22.50	22.50	23.00
16QAM	5	≤ 8	0-1	22.50	22.50	23.00
16QAM	5	> 8	0-2	21.50	21.50	22.00
QPSK	3	≤ 4	0	23.50	23.50	-
QPSK	3	> 4	0-1	22.50	22.50	-
16QAM	3	≤ 4	0-1	22.50	22.50	-
16QAM	3	> 4	0-2	21.50	21.50	-
QPSK	1.4	≤ 5	0	23.50	23.50	-
QPSK	1.4	> 5	0-1	22.50	22.50	-
16QAM	1.4	≤ 5	0-1	22.50	22.50	-
16QAM	1.4	> 5	0-2	21.50	21.50	-

**Remark:** The mark “-“ in gray means that this bandwidth is not supported.

**<WLAN 2.4GHz>**

Mode			Maximum Average Power (dBm)		
			Ant. 1	Ant. 2	Ant. 1+2
2.4GHz	802.11b	CH 01	19.50	20.50	23.00
		CH 06	17.50	20.50	20.50
		CH 11	19.00	20.50	22.50
	802.11g	CH 01	15.00	16.50	19.00
		CH 06	14.00	16.00	17.50
		CH 11	15.00	16.00	18.50
	802.11n-HT20	CH 01	15.00	16.50	19.00
		CH 06	14.00	16.00	17.50
		CH 11	15.00	16.00	18.50
	802.11n-HT40	CH 03	15.50	16.50	19.00
		CH 06	14.50	16.50	18.00
		CH 09	15.50	16.50	19.00

**<WLAN 5GHz>**

Mode		Maximum Average Power (dBm)		
		Ant. 1	Ant. 2	Ant. 1+2
5.2GHz	802.11a	14.50	15.00	17.50
	802.11n-HT20	14.50	15.00	17.50
	802.11n-HT40	15.00	15.50	18.50
	802.11ac-VHT20	12.50	13.00	16.00
	802.11ac-VHT40	11.50	12.00	15.00
	802.11ac-VHT80	11.50	12.00	15.00
5.8GHz	802.11a	13.00	15.00	18.00
	802.11n-HT20	13.00	15.00	18.00
	802.11n-HT40	13.50	15.50	17.50
	802.11ac-VHT20	11.00	12.50	15.00
	802.11ac-VHT40	10.50	12.00	14.50
	802.11ac-VHT80	10.50	12.00	14.00



#### **4. RF Exposure Limit Introduction**

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



## 5. Radio Frequency Radiation Exposure Evaluation

### 5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
GSM850 (1 Tx slot)	824.2	3.10	33.00	36.100	4.074	512.861	0.102	0.549	0.186
GPRS850 (1 Tx slot)	824.2	3.10	33.00	36.100	4.074	512.861	0.102	0.549	0.186
GPRS850 (2 Tx slots)	824.2	3.10	33.00	36.100	4.074	1023.293	0.204	0.549	0.371
GPRS850 (3 Tx slots)	824.2	3.10	32.50	35.600	3.631	1361.445	0.271	0.549	0.493
GPRS850 (4 Tx slots)	824.2	3.10	32.50	35.600	3.631	1819.701	0.362	0.549	0.659
EGPRS850 (1 Tx slot)	824.2	3.10	27.00	30.100	1.023	128.825	0.026	0.549	0.047
EGPRS850 (2 Tx slots)	824.2	3.10	27.00	30.100	1.023	257.040	0.051	0.549	0.093
EGPRS850 (3 Tx slots)	824.2	3.10	27.00	30.100	1.023	383.707	0.076	0.549	0.139
EGPRS850 (4 Tx slots)	824.2	3.10	27.00	30.100	1.023	512.861	0.102	0.549	0.186
GSM1900 (1 Tx slot)	1850.2	2.90	31.00	33.900	2.455	309.030	0.062	1.000	0.062
GPRS1900 (1 Tx slot)	1850.2	2.90	31.00	33.900	2.455	309.030	0.062	1.000	0.062
GPRS1900 (2 Tx slots)	1850.2	2.90	31.00	33.900	2.455	616.595	0.123	1.000	0.123
GPRS1900 (3 Tx slots)	1850.2	2.90	30.50	33.400	2.188	820.352	0.163	1.000	0.163
GPRS1900 (4 Tx slots)	1850.2	2.90	30.50	33.400	2.188	1096.478	0.218	1.000	0.218
EGPRS1900 (1 Tx slot)	1850.2	2.90	26.50	29.400	0.871	109.648	0.022	1.000	0.022
EGPRS1900 (2 Tx slots)	1850.2	2.90	26.50	29.400	0.871	218.776	0.044	1.000	0.044
EGPRS1900 (3 Tx slots)	1850.2	2.90	26.50	29.400	0.871	326.588	0.065	1.000	0.065
EGPRS1900 (4 Tx slots)	1850.2	2.90	26.50	29.400	0.871	436.516	0.087	1.000	0.087
WCDMA Band II	1852.4	2.90	25.00	27.900	0.617	616.595	0.123	1.000	0.123
WCDMA Band V	826.4	3.10	24.00	27.100	0.513	512.861	0.102	0.551	0.185
LTE Band 4	1710.7	2.60	23.50	26.100	0.407	407.380	0.081	1.000	0.081
LTE Band 12	699.7	3.10	23.50	26.600	0.457	457.088	0.091	0.466	0.195
LTE Band 41	2498.5	3.50	24.00	27.500	0.562	562.341	0.112	0.520	0.215

**Note:** For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.



Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
WLAN2.4GHz 802.11b Ant.1	2412	4.40	19.50	23.900	0.245	245.471	0.049	1.000	0.049
WLAN2.4GHz 802.11g Ant.1	2412	4.40	15.00	19.400	0.087	87.096	0.017	1.000	0.017
WLAN2.4GHz 802.11n-HT20 Ant.1	2412	4.40	15.00	19.400	0.087	87.096	0.017	1.000	0.017
WLAN2.4GHz 802.11n-HT40 Ant.1	2422	4.40	15.50	19.900	0.098	97.724	0.019	1.000	0.019
WLAN2.4GHz 802.11b Ant.2	2412	4.40	20.50	24.900	0.309	309.030	0.062	1.000	0.062
WLAN2.4GHz 802.11g Ant.2	2412	4.40	16.50	20.900	0.123	123.027	0.024	1.000	0.024
WLAN2.4GHz 802.11n-HT20 Ant.2	2412	4.40	16.50	20.900	0.123	123.027	0.024	1.000	0.024
WLAN2.4GHz 802.11n-HT40 Ant.2	2422	4.40	16.50	20.900	0.123	123.027	0.024	1.000	0.024
WLAN2.4GHz 802.11b Ant.1+2	2412	4.40	23.00	27.400	0.550	549.541	0.109	1.000	0.109
WLAN2.4GHz 802.11g Ant.1+2	2412	4.40	19.00	23.400	0.219	218.776	0.044	1.000	0.044
WLAN2.4GHz 802.11n-HT20 Ant.1+2	2412	4.40	19.00	23.400	0.219	218.776	0.044	1.000	0.044
WLAN2.4GHz 802.11n-HT40 Ant.1+2	2422	4.40	19.00	23.400	0.219	218.776	0.044	1.000	0.044
WLAN5.2GHz 802.11a Ant.1	5180	4.10	14.50	18.600	0.072	72.444	0.014	1.000	0.014
WLAN5.2GHz 802.11n-HT20 Ant.1	5180	4.10	14.50	18.600	0.072	72.444	0.014	1.000	0.014
WLAN5.2GHz 802.11n-HT40 Ant.1	5190	4.10	15.00	19.100	0.081	81.283	0.016	1.000	0.016
WLAN5.2GHz 802.11ac-VHT20 Ant.1	5180	4.10	12.50	16.600	0.046	45.709	0.009	1.000	0.009
WLAN5.2GHz 802.11ac-VHT40 Ant.1	5190	4.10	11.50	15.600	0.036	36.308	0.007	1.000	0.007
WLAN5.2GHz 802.11ac VHT80 Ant.1	5210	4.10	11.50	15.600	0.036	36.308	0.007	1.000	0.007
WLAN5.2GHz 802.11a Ant.2	5180	4.10	15.00	19.100	0.081	81.283	0.016	1.000	0.016
WLAN5.2GHz 802.11n-HT20 Ant.2	5180	4.10	15.00	19.100	0.081	81.283	0.016	1.000	0.016
WLAN5.2GHz 802.11n-HT40 Ant.2	5190	4.10	15.50	19.600	0.091	91.201	0.018	1.000	0.018
WLAN5.2GHz 802.11ac-VHT20 Ant.2	5180	4.10	13.00	17.100	0.051	51.286	0.010	1.000	0.010
WLAN5.2GHz 802.11ac-VHT40 Ant.2	5190	4.10	12.00	16.100	0.041	40.738	0.008	1.000	0.008
WLAN5.2GHz 802.11ac VHT80 Ant.2	5210	4.10	12.00	16.100	0.041	40.738	0.008	1.000	0.008
WLAN5.2GHz 802.11a Ant.1+2	5180	4.10	17.50	21.600	0.145	144.544	0.029	1.000	0.029
WLAN5.2GHz 802.11n-HT20 Ant.1+2	5180	4.10	17.50	21.600	0.145	144.544	0.029	1.000	0.029
WLAN5.2GHz 802.11n-HT40 Ant.1+2	5190	4.10	18.50	22.600	0.182	181.970	0.036	1.000	0.036
WLAN5.2GHz 802.11ac-VHT20 Ant.1+2	5180	4.10	16.00	20.100	0.102	102.329	0.020	1.000	0.020
WLAN5.2GHz 802.11ac-VHT40 Ant.1+2	5190	4.10	15.00	19.100	0.081	81.283	0.016	1.000	0.016
WLAN5.2GHz 802.11ac VHT80 Ant.1+2	5210	4.10	15.00	19.100	0.081	81.283	0.016	1.000	0.016
WLAN5.8GHz 802.11a Ant.1	5745	4.20	13.00	17.200	0.052	52.481	0.010	1.000	0.010
WLAN5.8GHz 802.11n-HT20 Ant.1	5745	4.20	13.00	17.200	0.052	52.481	0.010	1.000	0.010
WLAN5.8GHz 802.11n-HT40 Ant.1	5755	4.20	13.50	17.700	0.059	58.884	0.012	1.000	0.012
WLAN5.8GHz 802.11ac VHT20 Ant.1	5745	4.20	11.00	15.200	0.033	33.113	0.007	1.000	0.007
WLAN5.8GHz 802.11ac VHT40 Ant.1	5755	4.20	10.50	14.700	0.030	29.512	0.006	1.000	0.006
WLAN5.8GHz 802.11ac VHT80 Ant.1	5775	4.20	10.50	14.700	0.030	29.512	0.006	1.000	0.006
WLAN5.8GHz 802.11a Ant.2	5745	4.20	15.00	19.200	0.083	83.176	0.017	1.000	0.017
WLAN5.8GHz 802.11n-HT20 Ant.2	5745	4.20	15.00	19.200	0.083	83.176	0.017	1.000	0.017
WLAN5.8GHz 802.11n-HT40 Ant.2	5755	4.20	15.50	19.700	0.093	93.325	0.019	1.000	0.019
WLAN5.8GHz 802.11ac VHT20 Ant.2	5745	4.20	12.50	16.700	0.047	46.774	0.009	1.000	0.009
WLAN5.8GHz 802.11ac VHT40 Ant.2	5755	4.20	12.00	16.200	0.042	41.687	0.008	1.000	0.008
WLAN5.8GHz 802.11ac VHT80 Ant.2	5775	4.20	12.00	16.200	0.042	41.687	0.008	1.000	0.008
WLAN5.8GHz 802.11a Ant.1+2	5745	4.20	18.00	22.200	0.166	165.959	0.033	1.000	0.033
WLAN5.8GHz 802.11n-HT20 Ant.1+2	5745	4.20	18.00	22.200	0.166	165.959	0.033	1.000	0.033
WLAN5.8GHz 802.11n-HT40 Ant.1+2	5755	4.20	17.50	21.700	0.148	147.911	0.029	1.000	0.029
WLAN5.8GHz 802.11ac VHT20 Ant.1+2	5745	4.20	15.00	19.200	0.083	83.176	0.017	1.000	0.017
WLAN5.8GHz 802.11ac VHT40 Ant.1+2	5755	4.20	14.50	18.700	0.074	74.131	0.015	1.000	0.015
WLAN5.8GHz 802.11ac VHT80 Ant.1+2	5775	4.20	14.00	18.200	0.066	66.069	0.013	1.000	0.013

**Note:**

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. For WLAN MIMO mode, MIMO gain is the same as SISO gain respectively.

## 5.2. Collocated Power Density Calculation

Band	Maximum Power Density / Limit	$\Sigma(\text{Power Density / Limit})$ of WWAN + WLAN 2.4GHz + WLAN 5GHz
WWAN	0.659	0.724
WLAN 2.4GHz Ant.1	0.049	
WLAN 5GHz Ant.1	0.016	
WWAN	0.659	0.727
WLAN 2.4GHz Ant.1	0.049	
WLAN 5GHz Ant.2	0.019	
WWAN	0.659	0.737
WLAN 2.4GHz Ant.2	0.062	
WLAN 5GHz Ant.1	0.016	
WWAN	0.659	0.740
WLAN 2.4GHz Ant.2	0.062	
WLAN 5GHz Ant.2	0.019	
WWAN	0.659	<b>0.804</b>
WLAN 2.4GHz Ant.1+2	0.109	
WLAN 5GHz Ant.1+2	0.036	

### Note:

1. For collocation analysis, GPRS850 (4 Tx slots) is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
2.  $\Sigma(\text{Power Density / Limit})$ : This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN 2.4GHz + WLAN 5GHz.
3. For simultaneously analysis, since the summation of 3 transmitters can cover others combination of 2 transmitters, therefore in this section did not additional to evaluate 2TX combination of simultaneously transmission.
4. Considering the WWAN collocation with WLAN of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1.

## Conclusion:

According to 47 CFR §2.1091 and FCC KDB 447498 D01 v06, the RF exposure analysis concludes that the RF Exposure is FCC compliant.