



## RF Exposure evaluation

**Report Reference No.**.....: **GTS20190321004-1-5**

**FCC ID**.....: **2ALGI-INV02**

Compiled by

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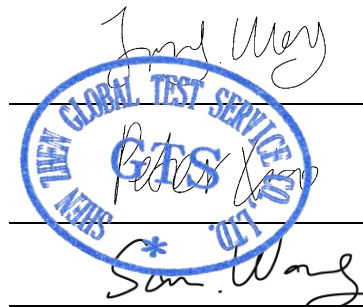
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Date of issue.....: May. 16, 2019



**Representative Laboratory Name .:** **Shenzhen Global Test Service Co.,Ltd.**

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No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District,  
Shenzhen, Guangdong

**Applicant's name** .....: **InvizBox Limited**

Address .....: LINC Centre, IT Blanchardstown, Blanchardstown, Dublin 15, D15  
VPT3, Ireland, Republic of

**Test specification** .....

Standard .....: **47CFR §1.1310**

.....: **47CFR §2.1091**

.....: **KDB447498 v06**

TRF Originator .....: Shenzhen Global Test Service Co.,Ltd.

Master TRF .....: Dated 2014-12

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**Test item description** .....: Router

Trade Mark .....: N/A

Manufacturer .....: **InvizBox Limited**

Model/Type reference.....: InvizBox 2

Listed Models .....: N/A

Exposure category.....: General population/uncontrolled environment

EUT Type .....: Production Unit

Rating .....: Input: AC 100-240V~50/60Hz 0.4A

Result.....: **PASS**

**TEST REPORT**

<b>Test Report No. :</b> GTS20190321004-1-5	May. 16, 2019
	Date of issue

Equipment under Test : Router

Model /Type : InvizBox 2

Listed Models : N/A

**Applicant** : **InvizBox Limited**

Address : LINC Centre, IT Blanchardstown, Blanchardstown, Dublin  
15, D15 VPT3, Ireland, Republic of

**Manufacturer** : **InvizBox Limited**

Address : LINC Centre, IT Blanchardstown, Blanchardstown, Dublin  
15, D15 VPT3, Ireland, Republic of

<b>Test Result:</b>	<b>PASS</b>
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The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# 1. SUMMARY

## 1.1. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/

## 1.2. Product Description

Name of EUT	Router
Trade Mark:	N/A
Model Number	InvizBox 2
Listed Models	N/A
FCC ID	2ALGI-INV02
Power Supply	DC 5V from adapter
Adapter information:	Model: MX15Z-0502500VU Input: AC 100-240V~50/60Hz 0.4A Output:DC 5V/2.5A
WLAN	Supported 802.11a/ac20/ac40/ac80/802.11b/802.11g/802.11n HT20/802.11n HT40
Modulation Type	CCK OFDM
Operation frequency	IEEE 802.11a/ac20/n20:5180MHz-5240MHz/5745MHz-5825MHz IEEE 802.11b:2412-2472MHz IEEE 802.11g:2412-2472MHz IEEE 802.11n HT20:2412-2472MHz IEEE 802.11n HT40:2422-2462MHz IEEE 802.11ac40/n40:5190MHz-5230MHz/5755MHz-5795MHz IEEE 802.11ac80:5210MHz / 5775MHz
Antenna Type	Internal Antennas
Antenna gain	2.4G WLAN Antenna Antenna 0, 2.0 dBi (Max.) 5G WLAN Antenna Antenna 1, 2.0 dBi (Max.) Antenna 2, 2.0 dBi (Max.) Drectional Gain: 5.0 dBi (Max.)

## **2. TEST ENVIRONMENT**

### **2.1. Address of the test laboratory**

**Shenzhen Global Test Service Co.,Ltd.**

1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

### **2.2. Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

### **2.3. Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

### **2.4. Statement of the measurement uncertainty**

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

<b>Test Items</b>	<b>Measurement Uncertainty</b>	<b>Notes</b>
Transmitter power conducted	0.57 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. Method of measurement

#### 3.1. Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

#### 3.2. Requirement

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is  $\leq 1.0$ . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions.

The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

#### 3.3. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
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

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

F=frequency in MHz

\*=Plane-wave equivalent power density

### 3.4. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

As declared by the Applicant, the EUT transmits with the maximum source-based Duty Cycle of 100%-see the User manual, and the EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum mobile separation distance,  $r = 20\text{cm}$ , as well as the gain of the used antenna is 1.06dBi for WLAN, and the power drift from Turn-up Procedure provide by manufacturer as following states, the RF power density can be obtained..

## 4. Evaluation Result

### 4.1. Standalone MPE

	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm <sup>2</sup> )	Power Density Limit (mW/cm <sup>2</sup> )	Test Results
		dBm	mW				
2.4GWLAN (Ant 0)	20.00	15.0	31.6228	1.58	0.0100	1.0000	PASS
5GWLAN (Ant 1)	20.00	12.0	15.8489	1.58	0.0050	1.0000	PASS
5GWLAN (Ant 2)	20.00	12.0	15.8489	1.58	0.0050	1.0000	PASS

### 4.2. Simultaneous transmission MPE Considerations

According to KDB447498 :For mobile exposure host platform to qualify for simultaneous transmission MPE test exclusion, all transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is  $\leq 1.0$ .

This means that:

$$\sum \text{ of MPE ratios } \leq 1.0$$

*Antenna 1 and Antenna 2 for 5GWLAN*

MPE <sub>Antenna1</sub> (mW/cm <sup>2</sup> )	MPE <sub>Antenna2</sub> (mW/cm <sup>2</sup> )	$\sum$ MPE ratios	Limit	Results
0.0050	0.0050	0.0100	1.0	PASS

*Maximum Simultaneous transmission MPE Ratios for 2.4GHz WLAN and 5G WLAN*

Maximum MPE ratio <sub>2.4GWLAN</sub>	Maximum MPE ratio <sub>5GWLAN</sub>	$\sum$ MPE ratios	Limit	Results
0.01	0.01	0.02	1.0	PASS

## **5. Conclusion**

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

**.....End of Report.....**