

RF EXPOSURE REPORT



Report No.: 15020210-FCC-H1

Supersede Report No.: N/A

Applicant	Beijing InHand Networks Technology Co., Ltd.		
Product Name	Embedded Computer		
Model No.	InBOX300		
Serial Model No.	InBOX310、InBOX320、InBOX330、InBOX300S、InBOX310S、InBOX320S、InBOX330S		
Test Standard	FCC 2.1091		
Test Date	December 04, 2015 to July 4, 2016		
Issue Date	July 04, 2016		
Test Result	☒ Pass ☐ Fail		
Equipment complied with the specification	☒		
Equipment did not comply with the specification	☐		
<i>Winnie Zhang</i>	<i>David Huang</i>		
Winnie Zhang Test Engineer	David Huang Checked By		
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only			

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
15020210-FCC-H1	NONE	Original	January 22,2016
15020210-FCC-H1	V1	Re-evaluated MPE	July 04, 2016

2 Customer information

Applicant Name	Beijing InHand Networks Technology Co., Ltd.
Applicant Add	101,West Wing,11th Floor,No.101,Lize central Park Wangjing,Chaoyang District,Beijing,100102,China
Manufacturer	Beijing InHand Networks Technology Co., Ltd.
Manufacturer Add	101,West Wing,11th Floor,No.101,Lize central Park Wangjing,Chaoyang District,Beijing,100102,China

3 Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	EZ EMC

4 Equipment under Test (EUT) Information

Description of EUT:	Embedded Computer
Main Model:	InBOX300
Serial Model:	InBOX310、InBOX320、InBOX330、InBOX300S、InBOX310S、InBOX320S、InBOX330S
Date EUT received:	July 13,2015
Test Date(s):	December 04, 2015 to July 4, 2016
Output power	GSM850: 32.32 dBm PCS1900: 30.00 dBm UMTS-FDD Band V :24.95 dBm UMTS-FDD Band II : 25.75 dBm WIFI:802.11g:22.61dBm WIFI:802.11n(40M):20.45 dBm
Antenna Gain:	GSM850/PCS1900:1 dBi UMTS-FDD Band V /UMTS-FDD Band II :2.5 dBi WIFI:802.11b/g/n(20M/40M): 2dBi
Type of Modulation:	GSM:GMSK UMTS-FDD: QPSK WIFI:802.11b/g/n(20M/40M): DSSS, OFDM
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz WIFI:802.11b/g/n(20M): 2412-2462 MHz WIFI:802.11n(40M):2422-2452 MHz
Number of Channels:	GSM 850: 124CH PCS1900: 299CH UMTS-FDD Band V : 102CH UMTS-FDD Band II : 277CH WIFI:802.11b/g/n(20M): 11CH WIFI:802.11n(40M): 7CH
Port:	Power Port、USB Port*4、Micro SD Port、ttyO6/7 Port , HDMI Port、SIM Port、Speaker Port、MIC Port、tty*2 O3、ttyO5*2、LAN Port
Input Power:	DC 9-24V

Trade Name : Inhand

FCC ID: 2AANYBOX

5 FCC §2.1091 - Maximum Permissible exposure (MPE)

5.1 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.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	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

Test Data

Predication of MPE limit at a given distance

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

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

WIFI:

Type	Test mode	CH	Freq (MHz)	Conducted Power (dBm)	Tune Up Power (dBm)
Output Power	802.11g	Low	2412	19.33	20.7±2
		Mid	2437	21.04	
		High	2462	22.61	
	802.11n (40M)	Low	2422	18.66	19.5±1
		Mid	2437	19.74	
		High	2452	20.45	

For the antenna manufacturer provide only used limited to ERP/EIRP or radiated spurious emission test. The MPE evaluation as below:

802.11g

The maximum peak output power (turn-up power) in low channel of WIFI is 22.7dBm

Maximum peak output power (turn-up power) at antenna input terminal: 186.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2412(MHz) lowest frequency

Antenna Gain (typical): 2 (dBi)

Antenna Gain (typical): 1.58 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0587(mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0587 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

The maximum peak output power (turn-up power) in Middle channel of BT is 22.7dBm

Maximum peak output power (turn-up power) at antenna input terminal: 186.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2437(MHz) lowest frequency

Antenna Gain (typical): 2 (dBi)

Antenna Gain (typical): 1.58 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0587(mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0587 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

The maximum peak output power (turn-up power) in High channel of BT is 22.7dBm

Maximum peak output power (turn-up power) at antenna input terminal: 186.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2462(MHz) lowest frequency

Antenna Gain (typical): 2 (dBi)

Antenna Gain (typical): 1.58 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0587(mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0587 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

802.11n(40M)

The maximum peak output power (turn-up power) in low channel of BT is 20.5 dBm

Maximum peak output power (turn-up power) at antenna input terminal: 112.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2422(MHz) lowest frequency

Antenna Gain (typical): 2 (dBi)

Antenna Gain (typical): 1.58 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0353 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0353 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

The maximum peak output power (turn-up power) in Middle channel of BT is 20.5dBm

Maximum peak output power (turn-up power) at antenna input terminal: 112.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2437(MHz) lowest frequency

Antenna Gain (typical): 2 (dBi)

Antenna Gain (typical): 1.58 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0353(mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0353 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

The maximum peak output power (turn-up power) in High channel of BT is 20.5dBm

Maximum peak output power (turn-up power) at antenna input terminal: 112.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 2452(MHz) lowest frequency

Antenna Gain (typical): 2 (dBi)

Antenna Gain (typical): 1.58 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.0353(mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.0353 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

Type	Test mode	Conducted Power (dBm)	Tune Up Power (dBm)
Output Power	GSM 850	32.32	31.5±1
	GSM 1900	30	29.5±1

GSM 850

The maximum peak output power (turn-up power) in GSM850 is 32.5 dBm

Maximum peak output power (turn-up power) at antenna input terminal: 1778.28 (mW)

Prediction distance: >20 (cm)

Predication frequency: 850(MHz)

Antenna Gain (typical): 1 (dBi)

Antenna Gain (typical): 1.26 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.445 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 0.567 (mW/cm²)

$$0.445 \text{ (mW/cm}^2\text{)} < 0.567 \text{ (mW/cm}^2\text{)}$$

GSM 1900

The maximum peak output power (turn-up power) in GSM1900 is 30.5 dBm

Maximum peak output power (turn-up power) at antenna input terminal: 1122.02 (mW)

Prediction distance: >20 (cm)

Predication frequency: 1900(MHz)

Antenna Gain (typical): 1 (dBi)

Antenna Gain (typical): 1.26 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.281 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.281 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

Type	Test mode	Conducted Power (dBm)	Tune Up Power (dBm)
Output Power	UMTS-FDD Band V	24.95	24±1
	UMTS-FDD Band II	25.75	25±1

UMTS-FDD Band V

The maximum peak output power (turn-up power) in GSM850 is 25 dBm

Maximum peak output power (turn-up power) at antenna input terminal: 316.2 (mW)

Prediction distance: >20 (cm)

Predication frequency: 850(MHz)

Antenna Gain (typical): 2.5 (dBi)

Antenna Gain (typical): 1.79 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.112 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 0.567 (mW/cm²)

$$0.112 \text{ (mW/cm}^2\text{)} < 0.567 \text{ (mW/cm}^2\text{)}$$

UMTS-FDD Band II

The maximum peak output power (turn-up power) in GSM1900 is 26 dBm

Maximum peak output power (turn-up power) at antenna input terminal: 395.1 (mW)

Prediction distance: >20 (cm)

Predication frequency: 1900(MHz)

Antenna Gain (typical): 2.5 (dBi)

Antenna Gain (typical): 1.79 (numeric)

The worst case is power density at predication frequency at 20 cm: 0.141 (mW/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mW/cm²)

$$0.141 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)}$$

Result: Pass

Test mode	Freq (MHz)	Max Conducted Power (dBm)	MPE(mW/cm ²)	Limit (mW/cm ²)	Result
802.11g	2462	22.7	0.0587	1	Pass
802.11n(40M)	2452	20.5	0.0354	1	Pass
GSM 850	-	32.5	0.4454	0.567	Pass
GSM 1900	-	30.5	0.2810	1	Pass
UMTS-FDD Band V	-	25	0.1119	0.567	Pass
UMTS-FDD Band II	-	26	0.1408	1	Pass

Simultaneous transmission MPE result:

GSM850+802.11g

$0.4454 + 0.0587 = 0.5041 \text{ mW/cm}^2$

$0.5041 \text{ mW/cm}^2 < 1 \text{ mW/cm}^2$

UMTS-FDD Band II +802.11g

$0.1408 + 0.0587 = 0.1995 \text{ mW/cm}^2$

$0.1995 \text{ mW/cm}^2 < 1 \text{ mW/cm}^2$

Result:Pass

Antenna Gain (typical): 1 dBi, 1.26(numeric)

2.5 dBi, 1.78(numeric)

Prediction distance: $\geq 20 \text{ cm}$

The power density level worst case at 20 cm is below the uncontrolled exposure limit.