



# FCC Maximum Permissible Exposure(MPE) Estimation Report

Product Name: OBD BOX

Model: DA3100

Report No.: SYBH(Z-SAR)023072013-2

FCC ID: QISDA3100

	APPROVED (Lab Manager)	PREPARED (Test Engineer)
BY	<i>Alwinway</i>	<i>Sun Shaobin</i>
DATE	2013-08-12	2013-08-12

The test results of this test report relate exclusively to the item(s) tested , The HUAWEI does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of HUAWEI.

## Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian,  
Longgang District, Shenzhen, 518129, P.R.C  
Tel: +86 755 28780808 Fax: +86 755 89652518



※ ※ **Modified History** ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2013-08-12	Sun Shaobin



## Table of Contents

1	EUT Description .....	4
1.1	General Description.....	4
2	Test specification(s).....	5
3	Testing laboratory.....	5
4	Applicant and Manufacturer .....	5
5	Application details.....	5
6	Ambient Condition .....	5
7	RF Exposure Requirements .....	6
8	RF Exposure Evaluation.....	9
8.1	Operation in GSM850.....	9
8.2	Operation in GSM1900.....	10
8.3	Operation in UMTS Band II .....	11
8.4	Operation in UMTS Band V .....	11
8.5	Operation in BT .....	11
9	Exposure calculations for multiple sources.....	12
9.1	Estimation for GSM850& BT .....	13
9.2	Estimation for GSM1900& BT .....	13
9.3	Estimation for UMTS Band II & BT.....	13
9.4	Estimation for UMTS Band V & BT .....	13



# 1 EUT Description

Device Information:			
DUT Name:	OBD BOX		
Type Identification:	DA3100		
Device Type :	Mobile		
FCC ID:	QISDA3100		
Device Phase:	Identical Prototype		
Exposure Category:	Uncontrolled environment/general population		
Hardware Version :	CD0DA31M		
Software Version :	11.815.00.74.00		
Antenna Type :	internal Antenna		
Gain:	850M: <-2.2dBi 1900M: <2.5dBi 2400M: <3.4dBi		
Device Operating Configurations:			
Supporting Mode(s)	GSM850/1900,UMTS Band II / V, BT(Tested)		
Test Modulation	GMSK/8PSK/QPSK/GFSK		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM850	824-849	869-894
	GSM1900	1850-1910	1930-1990
	UTMS Band II	1850-1910	1930-1990
	UTMS Band V	824-849	869-894
	BT	2400-2483.5	2400-2483.5

## 1.1 General Description

DA3100 is an OBD BOX for AUTO. DA3100 can support the wireless communication of 3G (UMTS850/1900Mhz), 2G (GPRS/EDGE850/1900Mhz), and GPS, G-Sensor, BT4.0 function. The wireless communication of 3G/2G is realized by module MU509-C. the DA3100 also support the vehicular OBD bus: CAN, K&L-LINE, and J1850.



## 2 Test specification(s)

ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 4 of March 2010))
KDB 447498 D01	General RF Exposure Guidance v05r01

## 3 Testing laboratory

Test Site	The Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	Zone K3,Huawei Industrial Base, Bantian Industry Area, Longgang District, Shenzhen, Guangdong, China
Telephone	+86 755 28780808
Fax	+86 755 89652518
State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310 A2LA TESTING CERT #2174.01

## 4 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

## 5 Application details

Start Date of test	2013-08-12
End Date of test	2013-08-12

## 6 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%



## 7 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies to the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC's MPE limits for field strength and power density are given in 47CFR 1.1310(Table below).These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.



**Table: Limits For Maximum Permissible Exposure (MPE)**

<b>(A) Limits for Occupational/controlled Exposure</b>				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm <sup>2</sup> )	Averaging Time (minute) E  <sup>2</sup> , H  <sup>2</sup> or S
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>				
Frequency Range(MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength(H)(A/m)	Power Density (S)(mW/cm <sup>2</sup> )	Averaging Time (minute) E  <sup>2</sup> , H  <sup>2</sup> or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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	

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

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



R= distance to the centre of radiation of the antenna

$$\text{EIRP} = P * G$$

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.



## 8 RF Exposure Evaluation

### 8.1 Operation in GSM850

(uplink: 824-849MHz, downlink: 869-894MHz)

Mode	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R (cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
GPRS/EDGE 1TS (GMSK) *(1/8)	33	-2.2	30.8	150.28	20	0.030	0.549	<b>PASS</b>
GPRS/EDGE 2TS (GMSK) *(2/8)	33	-2.2	30.8	300.57	20	<b>0.060</b>	0.549	<b>PASS</b>
EDGE 1TS (8PSK) *(1/8)	27.5	-2.2	25.3	42.36	20	0.008	0.549	<b>PASS</b>
EDGE 2TS (8PSK) *(2/8)	27.5	-2.2	25.3	84.71	20	0.017	0.549	<b>PASS</b>
EDGE 3TS (8PSK) *(3/8)	27.5	-2.2	25.3	127.07	20	0.025	0.549	<b>PASS</b>
EDGE 4TS (8PSK) *(4/8)	27.5	-2.2	25.3	169.42	20	0.034	0.549	<b>PASS</b>

Note: \*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.060mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 0.549mW/cm<sup>2</sup> at 824MHz, so we can conclude it is into compliance.



## 8.2 Operation in GSM1900

(uplink: 1850-1910MHz, downlink: 1930-1990MHz)

Mode	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R (cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
GPRS/EDGE 1TS (GMSK) *(1/8)	30	2.5	32.5	222.28	20	0.044	1.000	<b>PASS</b>
GPRS/EDGE 2TS (GMSK) *(2/8)	30	2.5	32.5	444.57	20	<b>0.088</b>	1.000	<b>PASS</b>
EDGE 1TS (8PSK) *(1/8)	26.5	2.5	29	99.29	20	0.020	1.000	<b>PASS</b>
EDGE 2TS (8PSK) *(2/8)	26.5	2.5	29	198.58	20	0.040	1.000	<b>PASS</b>
EDGE 3TS (8PSK) *(3/8)	26.5	2.5	29	297.87	20	0.059	1.000	<b>PASS</b>
EDGE 4TS (8PSK) *(4/8)	26.5	2.5	29	397.16	20	0.079	1.000	<b>PASS</b>

Note:\*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.088mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 1.0mW/cm<sup>2</sup> at 1850MHz, so we can conclude it is into compliance.



### 8.3 Operation in UMTS Band II

(uplink: 1850-1910MHz, downlink: 1930-1990MHz)

Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
23.5	2.5	26.0	398.11	20	0.079	1.000	<b>PASS</b>

Note:\*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.079mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 1.0mW/cm<sup>2</sup> at 1850MHz, so we can conclude it is into compliance.

### 8.4 Operation in UMTS Band V

(uplink: 824-849MHz, downlink: 869-894MHz)

Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
23.5	-2.2	21.3	134.90	20	0.027	0.549	<b>PASS</b>

Note:\*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.027mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 0.549mW/cm<sup>2</sup> at 824MHz, so we can conclude it is into compliance.

### 8.5 Operation in BT

(uplink: 2400-2483.5MHz, downlink: 2400-2483.5MHz)

Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Conclusion
-0.5	3.4	2.9	1.95	20	<0.001	1.000	<b>PASS</b>

Note:\*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is <0.001mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 1.000mW/cm<sup>2</sup> at 2400MHz, so we can conclude it is into compliance.



## 9 Exposure calculations for multiple sources

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of  $E^2$ ,  $H^2$  (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

The product also has multiple transmitters The Simultaneous Transmission Possibilities are as below:

<b>Simultaneous Tx Combination</b>	<b>Configuration</b>
1	GSM/UMTS +BT

**9.1 Estimation for GSM850& BT**

Mode	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
GSM850	0.060	0.549	<0.110	PASS
BT	<0.001	1.000		

**9.2 Estimation for GSM1900& BT**

Mode	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
GSM1900	0.088	1.000	<0.089	PASS
BT	<0.001	1.000		

**9.3 Estimation for UMTS Band II & BT**

Mode	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
UMTS Band II	0.079	1.000	<0.080	PASS
BT	<0.001	1.000		

**9.4 Estimation for UMTS Band V & BT**

Mode	S (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Calculation result	Conclusion
UMTS Band V	0.027	0.549	<0.050	PASS
BT	<0.001	1.000		

According to the Table above, we can conclude that the calculation results of all simultaneous transmission possibilities are less than 1, so it is into compliance.

Therefore the product also meets the requirements under multiple sources condition.

-----END-----