EMF TEST REPORT

No. I15Z41308-GPM01

For

ZTE CORPORATION

4G Wireless Router

Model Name: MF253M

FCC ID: SRQ-MF253MA

With

Hardware Version: MF253M.H01

Software Version: EN_VIVO_BR_MF253MV1.0.1B02

Issued Date: 2015-07-03

TESTING
CNAS L0570

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I15Z41308-GPM01	Rev.0	1st edition	2015-7-3

TABLE OF CONTENT

1 Test Laboratory

1.1 Testing Location

Company	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2 Testing Environment

Temperature:	18°C~25 °C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise & Reflection:	< 0.012 W/kg

1.3 Project Data

Testing Start Date:	2015-06-25
Testing End Date:	2015-07-03

1.4 Signature

(Prepared this test report)

(Reviewed this test report)

Director of the laboratory

(Approved this test report)

2 Client Information

2.1 Applicant Information

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2.2 Manufacturer Information

Company Name: ZTE CORPORATION
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Country: China
Telephone: +86-18616587757
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3 Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1 About EUT

Description:	GSM Wireless Phone
Model name:	MF253M
Marketing name:	ZTE
Operating mode(s):	GSM850/900/1800/1900, WCDMA850/1900/2100, LTE Band 2/4/7, WiFi2.4G
GPRS Multislot Class:	10
GPRS capability Class:	A
EGPRS Multislot Class:	12
WCDMA Category:	HSDPA: 8 HSUPA: 9 HSPA+: 7 DC-HSDPA:8
Release Version:	GSM: R99 GPRS: R99 UMTS: R8
Device type:	Portable device
Accessories/Body-worn configurations:	/
Hotspot mode:	Support simultaneous transmission of hotspot data
Tested Tx Frequency:	824.2 – 848.8 MHz (GSM 850) 1850.2 – 1909.8 MHz (GSM 1900) 826.4–846.6 MHz (WCDMA850 Band V) 1852.4–1907.6 MHz (WCDMA1900 Band II) 2502.5 – 2567.5 MHz (LTE FDD Band 7) 2412 – 2462 MHz (Wi-Fi 2.4G)

3.2 Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	/	MF253M.H01	EN_VIVO_BR_MF253MV1.0.1B02

*EUT ID: is used to identify the test sample in the lab internally.

3.3 Internal Identification of AE

AE ID*	Description	Model	SN	Manufacturer
AE1	/	/	/	/

*AE ID: is used to identify the test sample in the lab internally.

4 Reference Documents

4.1 Applicable Limit Regulations

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

4.2 Applicable Measurement Standards

FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v05r01: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.

5 RF Exposure Limit

Limits for General Population/Uncontrolled Exposure in §1.1310

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (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

6 Friis Formula

Friis transmission formula : $Pd = (Pout*G) / (4*Pi*r^2)$

where

Pd = power density in **W/m^2**

Pout = output power to antenna in **W**

G = gain of antenna in linear scale

Pi = **3.1416**

R = distance between observation point and center of the radiator in **m**

Pd is the limit of MPE. If we know the maximum Gain of the antenna and the

total power input to the antenna, through the calculation, we will know the MPE value at distance 20cm.

7 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as Mobile Device.

8 Test Results

8.1 The maximum antenna gain

The maximum antenna gain for external antenna is

GSM850/900, WCDMA850,	1.5dBi
GSM1800/1900, WCDMA1900/2100, LTE B2/4 Wi-Fi 2.4G:	2.5dBi
LTE B7：	2.9dBi

8.2 Output Power Into Antenna & RF Exposure value at distance 20cm

The conducted power calculation results for GSM

Mode	Timeslot	Peak Output Power (dBm)
GPRS 850	1 slot	32.40
GPRS 850	2 slots	31.18
GPRS 850	3 slots	29.21
GPRS 850	4 slots	28.22
EGPRS 850	1 slot	32.40
EGPRS 850	2 slots	31.18
EGPRS 850	3 slots	29.21
EGPRS 850	4 slots	28.21
GPRS 1900	1 slot	29.25
GPRS 1900	2 slots	28.08
GPRS 1900	3 slots	26.10
GPRS 1900	4 slots	25.16
EGPRS 1900	1 slot	29.25
EGPRS 1900	2 slots	28.07
EGPRS 1900	3 slots	26.10
EGPRS 1900	4 slots	25.16

The conducted power measurement results for WCDMA

Mode	Average Output Power(dBm)		
	RMC	HSDPA	HSUPA
UMTS Band 5	22.07	22.11	22.35
UMTS Band 2	22.26	22.37	22.10

The conducted power measurement results for LTE

Mode	Band-width (MHz)	Average Output Power(dBm)	
		QPSK	16QAM
LTE Band 2	1.4	21.33	20.52
	3	21.29	20.91
	5	21.46	20.68
	10	21.39	20.90
LTE Band4	1.4	21.43	20.54

	3	21.47	20.66
	5	21.30	20.36
	10	21.45	20.46
LTE Band 7	5	23.02	22.02
	10	22.87	21.96
	15	23.06	22.13
	20	23.29	21.13

The average conducted power for Wi-Fi is as following:

802.11b（dBm）

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1(2412MHz)	15.66	15.48	15.24	14.89
6(2437MHz)	15.46	/	/	/
11(2462MHz)	16.06	/	/	/

802.11g（dBm）

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1(2412MHz)	11.25	11.08	10.87	10.55	10.18	9.57	9.17	8.91
6(2437MHz)	11.26	/	/	/	/	/	/	/
11(2462MHz)	11.86	/	/	/	/	/	/	/

802.11n- HT20 (2.4G) MIMO off（dBm）

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1(2412MHz)	11.10	10.60	10.29	9.98	9.48	9.02	8.91	8.74
6(2437MHz)	11.11	/	/	/	/	/	/	/
11(2462MHz)	11.93	/	/	/	/	/	/	/

802.11n- HT20 (2.4G) MIMO on（dBm）

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1(2412MHz) Ant 1	8.17	7.27	6.61	5.97	4.51	5.12	5.02	4.87
1(2412MHz) Ant 2	8.09	7.29	6.86	6.57	5.88	5.45	5.36	5.19
6(2437MHz) Ant 1	7.59	/	/	/	/	/	/	/
6(2437MHz) Ant 2	7.88	/	/	/	/	/	/	/
11(2462MHz) Ant 1	5.14	/	/	/	/	/	/	/
11(2462MHz) Ant 2	7.36	/	/	/	/	/	/	/

802.11n- HT40 (2.4G) MIMO off（dBm）

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
3(2422MHz)	11.04	10.31	9.74	9.31	8.66	8.13	8.02	7.81
6(2437MHz)	10.63	/	/	/	/	/	/	/
9(2452MHz)	11.17	/	/	/	/	/	/	/

802.11n- HT40 (2.4G) MIMO on（dBm）

Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7

3(2422MHz) Ant 1	7.28	6.43	5.86	5.42	4.91	4.46	4.37	4.25
3(2422MHz) Ant 2	6.85	5.99	5.47	5.04	4.52	4.12	4.01	3.90
6(2437MHz) Ant 1	7.51	/	/	/	/	/	/	/
6(2437MHz) Ant 2	7.30	/	/	/	/	/	/	/
9(2452MHz) Ant 1	7.79	/	/	/	/	/	/	/
9(2452MHz) Ant 2	7.16	/	/	/	/	/	/	/

8.3 Tune Up Procedure

Measurement Procedure for GSM:

1.Connect EUT with CMU200(E5515C) through RF cable. Make a call from CMU200

2.After setup a call,Set Power Level to 5 for GSM850 and 0 for PCS1900

3. Measure the Output Power AV value

Remarks: All Output Power are tested in Average Value specification .

Table 1: GPRS&EDGE (GMSK Modulation)

GSM 850 GPRS				
Channel		251	190	128
1 Txslot	Target (dBm)	31	31	31
	Tolerance ±(dB)	1.5	1.5	1.5
2 Txslots	Target (dBm)	30	30	30
	Tolerance ±(dB)	1	1	1
3 Txslots	Target (dBm)	29	29	29
	Tolerance ±(dB)	1	1	1
4 Txslots	Target (dBm)	28	28	28
	Tolerance ±(dB)	1	1	1
GSM850 EGPRS				
1 Txslot	Target (dBm)	32	32	32
	Tolerance ±(dB)	1.5	1.5	1.5
2 Txslots	Target (dBm)	31	31	31
	Tolerance ±(dB)	1	1	1
3Txslots	Target (dBm)	29	29	29
	Tolerance ±(dB)	1	1	1
4 Txslots	Target (dBm)	28	28	28
	Tolerance ±(dB)	1	1	1
PCS 1900 GPRS				
Channel		810	661	512
1 Txslot	Target (dBm)	29	29	29
	Tolerance ±(dB)	1.5	1.5	1.5
2 Txslots	Target (dBm)	28	28	28
	Tolerance ±(dB)	1	1	1
3 Txslots	Target (dBm)	26	26	26
	Tolerance ±(dB)	1	1	1
4 Txslots	Target (dBm)	25	25	25
	Tolerance ±(dB)	1	1	1

PCS1900 EGPRS				
1 Txslot	Target (dBm)	29	29	29
	Tolerance ±(dB)	1.5	1.5	1.5
2 Txslots	Target (dBm)	28	28	28
	Tolerance ±(dB)	1	1	1
3Txslots	Target (dBm)	26	26	26
	Tolerance ±(dB)	1	1	1
4 Txslots	Target (dBm)	25	25	25
	Tolerance ±(dB)	1	1	1

Table 2: WCDMA

WCDMA Band 5			
Channel	Channel 4132	Channel 4183	Channel 4233
Target (dBm)	23.5	23.5	23.5
Tolerance ±(dB)	1	1	1
HSDPA			
Channel	Channel 4132	Channel 4183	Channel 4233
Target (dBm)	23.5	23.5	23.5
Tolerance ±(dB)	1	1	1
HSUPA			
Channe	Channel 4132	Channel 4183	Channel 4233
Target (dBm)	22	22	22
Tolerance ±(dB)	2	2	2
WCDMA Band 2			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	23	23	23
Tolerance ±(dB)	1	1	1
HSDPA			
Channel	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	23	23	23
Tolerance ±(dB)	1	1	1
HSUPA			
Channe	Channel 9262	Channel 9400	Channel 9538
Target (dBm)	22	22	22
Tolerance ±(dB)	2	2	2

Table 3: LTE

LTE Band 2			
Channel	Channel 2800	Channel 3100	Channel 3400
Target (dBm)	20	20	20
Tolerance ±(dB)	1.5	1.5	1.5
LTE Band 4			
Channel	Channel 9260	Channel 9435	Channel 9610

Target (dBm)	20	20	20
Tolerance ±(dB)	1.5	1.5	1.5
LTE Band 7			
Channel	Channel 2800	Channel 3100	Channel 3400
Target (dBm)	21.8	21.8	21.8
Tolerance ±(dB)	1.5	1.5	1.5

Table 4: WiFi

	WiFi 802.11b			
Data rate	Channel	Channel 1	Channel 6	Channel 11
1	Target (dBm)	16	16	16
	Tolerance ±(dB)	1	1	1
2	Target (dBm)	15.5	15.5	15.5
	Tolerance ±(dB)	1	1	1
5.5	Target (dBm)	15	15	15
	Tolerance ±(dB)	1	1	1
11	Target (dBm)	14.5	14.5	14.5
	Tolerance ±(dB)	1	1	1
	WiFi 802.11g			
Data rate	Channel	Channel 1	Channel 6	Channel 11
6	Target (dBm)	11	11	11
	Tolerance ±(dB)	1	1	1
9	Target (dBm)	10.5	10.5	10.5
	Tolerance ±(dB)	1	1	1
12	Target (dBm)	10	10	10
	Tolerance ±(dB)	1	1	1
18	Target (dBm)	10	10	10
	Tolerance ±(dB)	1	1	1
24	Target (dBm)	10	10	10
	Tolerance ±(dB)	1	1	1
36	Target (dBm)	9	9	9
	Tolerance ±(dB)	1	1	1
48	Target (dBm)	9	9	9
	Tolerance ±(dB)	1	1	1
54	Target (dBm)	8	8	8
	Tolerance ±(dB)	1	1	1
	WiFi 802.11n			
	Channel	Channel 1	Channel 6	Channel 11
MCS0	Target (dBm)	11	11	11
	Tolerance ±(dB)	1	1	1
MCS1	Target (dBm)	10	10	10
	Tolerance ±(dB)	1	1	1
MCS2	Target (dBm)	10	10	10

	Tolerance ±(dB)	1	1	1
MCS3	Target (dBm)	9	9	9
	Tolerance ±(dB)	1	1	1
MCS4	Target (dBm)	9	9	9
	Tolerance ±(dB)	1	1	1
MCS5	Target (dBm)	9	9	9
	Tolerance ±(dB)	1	1	1
MCS6	Target (dBm)	8	8	8
	Tolerance ±(dB)	1	1	1
MCS7	Target (dBm)	8	8	8
	Tolerance ±(dB)	1	1	1

Table 5: WiFi MIMO

WiFi 802.11n 20				
Data rate	Channel	Channel 1	Channel 6	Channel 11
MCS0	Target (dBm)	8	8	8
	Tolerance ±(dB)	1	1	1
MCS1	Target (dBm)	7	7	7
	Tolerance ±(dB)	1	1	1
MCS2	Target (dBm)	7	7	7
	Tolerance ±(dB)	1	1	1
MCS3	Target (dBm)	6	6	6
	Tolerance ±(dB)	1	1	1
MCS4	Target (dBm)	5	5	5
	Tolerance ±(dB)	1	1	1
MCS5	Target (dBm)	5	5	5
	Tolerance ±(dB)	1	1	1
MCS6	Target (dBm)	5	5	5
	Tolerance ±(dB)	1	1	1
MCS7	Target (dBm)	5	5	5
	Tolerance ±(dB)	1	1	1

Table 6: WiFi MIMO

WiFi 802.11n 20				
Data rate	Channel	Channel 1	Channel 6	Channel 11
MCS0	Target (dBm)	7	7	7
	Tolerance ±(dB)	1	1	1
MCS1	Target (dBm)	6	6	6
	Tolerance ±(dB)	1	1	1
MCS2	Target (dBm)	5	5	5
	Tolerance ±(dB)	1	1	1
MCS3	Target (dBm)	5	5	5
	Tolerance ±(dB)	1	1	1
MCS4	Target (dBm)	4	4	4

	Tolerance ±(dB)	1	1	1
MCS5	Target (dBm)	4	4	4
	Tolerance ±(dB)	1	1	1
MCS6	Target (dBm)	4	4	4
	Tolerance ±(dB)	1	1	1
MCS7	Target (dBm)	4	4	4
	Tolerance ±(dB)	1	1	1

8.4 The maximum antenna gain

The worst cases for each frequency band

Frequency band	Average Output Power(dBm)	Average Output Power(mW)	Antenna gain(dBi)	Antenna gain(numeric)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)	PASS /FAIL
GPRS 850	32.40	1737.80	1.5	1.41	0.49	0.57	PASS
GPRS 1900	29.25	841.40	2.5	1.78	0.30	1	PASS
WCDMA 850	22.35	171.79	1.5	1.41	0.05	0.57	PASS
WCDMA 1900	22.37	172.58	2.5	1.78	0.06	1	PASS
LTE Band 2	21.46	139.96	2.5	1.78	0.04	1	PASS
LTE Band 4	21.47	140.28	2.5	1.78	0.04	1	PASS
LTE Band 7	23.29	213.30	2.9	1.95	0.08	1	PASS
Wi-Fi 2.4G	16.06	40.36	2.5	1.78	0.01	0.47	PASS
802.11n HT20 MIMO on	8.17	6.56	2.5	1.78	0.0023	0.47	PASS
802.11n HT40 MIMO on	7.79	6.01	2.5	1.78	0.0021	0.47	PASS

Note: The value of GPRS is chosen for summation due to the highest power density among all wireless modes of the main antenna.

8.5Evaluation of Simultaneous Transmission

MIMO is applied in Wi-Fi 802.11n with multiple antennas as shown below:

The Sum of Power Density for Wifi MIMO

Mode	Power Density of Antenna 1 (mW/cm^2)	Power Density of Antenna 1 (mW/cm^2)	Sum of Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)	PASS/FAIL
802.11n MIMO	0.0023	0.0021	0.0044	1	PASS

Note: The power density of Normal Wi-Fi 2.4G is higher than that of Wi-Fi MIMO, so the former is chosen for summation.

The Sum of Power Density for main antenna and Wifi

Mode	Power Density of Main Antenna	Power Density of Wi-Fi	Sum of Power Density	Limit of Power Density	PASS/FAIL

	(mW/cm^2)	(mW/cm^2)	(mW/cm^2)	(mW/cm^2)	
GPRS850	0.49	0.01	0.50	0.57	PASS

The Sum of Power Density for main antenna and Wifi:

MPE1/MPE1limit + MPE2/MPE2 limit=(0.49/0.57) + (0.0044/1)

$$= 0.86 + 0.0044$$
$$= 0.8644 < 1$$

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(No. CNAS L0570)

Telecommunication Technology Labs,

Academy of Telecommunication Research, MIIT

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No.51, Xueyuan Road, Haidian District, Beijing, China

to ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing and calibration.*

The scope of accreditation is detailed in the attached schedule bearing the same accreditation number as above. The schedule forms an integral part of this certificate.

Date of Issue：2014-10-29

Date of Expiry：2017-06-19

Date of Initial Accreditation：1998-07-03

Signed on behalf of China National Accreditation Service
for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

No.CNAS AL 2

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END OF REPORT