

Variant FCC RF Test Report

APPLICANT : ZTE CORPORATION
EQUIPMENT : LTE/WCDMA/GSM (GPRS) Multi-Mode
Digital Mobile Phone
BRAND NAME : ZTE
MODEL NAME : Z988
FCC ID : SRQ-Z988
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

This is a variant report which is only valid together with the original test report. The product was received on Oct. 25, 2016 and testing was completed on Nov. 30, 2016. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.



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**REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR5O2302-02B	Rev. 01	This is a variant report for Z988. The product equality declaration could be referred to Appendix D. All the test cases were performed in original report which can be referred to Sporton Report Number FR5O2302B. Based on the original test report, only the worst cases of Radiated Spurious Emission were verified for the differences.	Dec. 06, 2016



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.63 dB at 31.940 MHz



1 General Description

1.1 Applicant

ZTE CORPORATION

ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

1.2 Manufacturer

ZTE CORPORATION

ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z988
FCC ID	SRQ-Z988
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/ HSPA+(16QAM uplink is not supported)/LTE/ WLAN 2.4GHz 802.11b/g/n HT20/ WLAN 5GHz 802.11a/n HT20/ WLAN 5GHz 802.11ac VHT20/VHT40/VHT80/ Bluetooth v2.1 + EDR/Bluetooth v4.1 LE
IMEI Code	Radiation: 868962021292968/868962021292902
HW Version	Z988HWV1.0
SW Version	Z988V1.0.0B01
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Antenna Type / Gain	IFA Antenna with gain 1.00 dBi
Type of Modulation	Bluetooth LE : GFSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.	
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958	
Test Site No.	Sporton Site No.	FCC Registration No.
	03CH03-KS	306251

Note: The test site complies with ANSI C63.4 2014 requirement.

1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

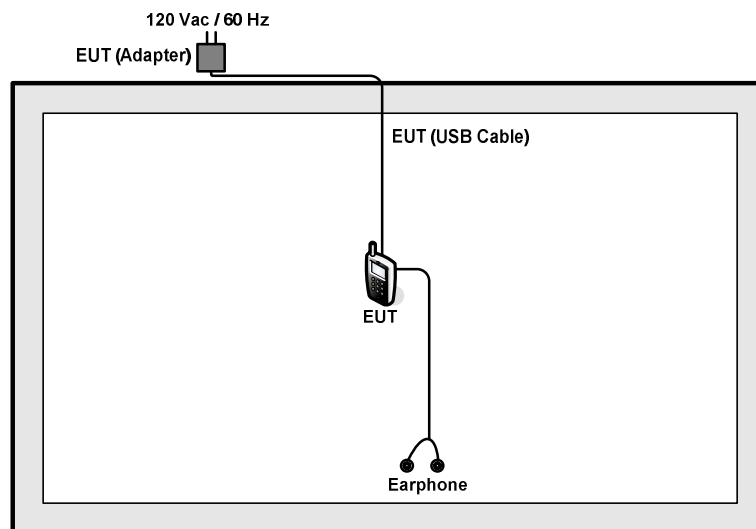
2.1 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth v4.1 LE / GFSK
Radiated TCs	Mode 1: Bluetooth Tx CH39_2480 MHz_1Mbps
Remark: For Radiated Test Cases, The tests were performance with Adapter, Earphone, and USB Cable.	

2.2 Connection Diagram of Test System

<Bluetooth LE Tx Mode>





2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Earphone	Lenovo	LH102	N/A	Unshielded, 1.2 m	N/A

2.4 EUT Operation Test Setup

For Bluetooth v4.1 LE function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

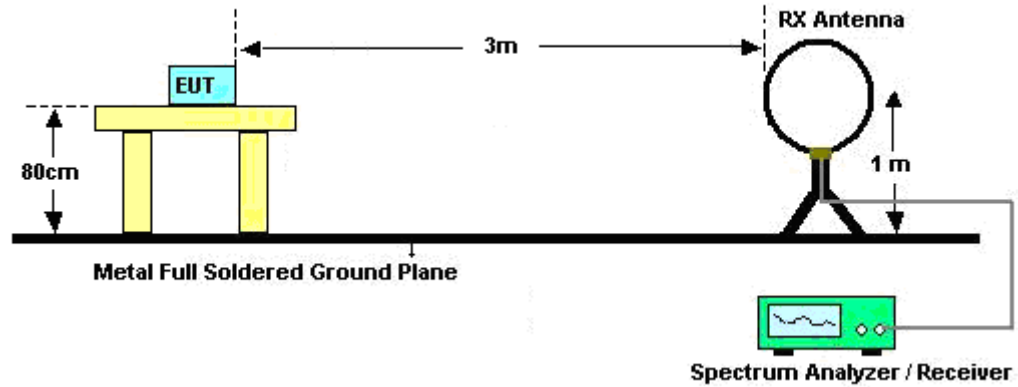
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

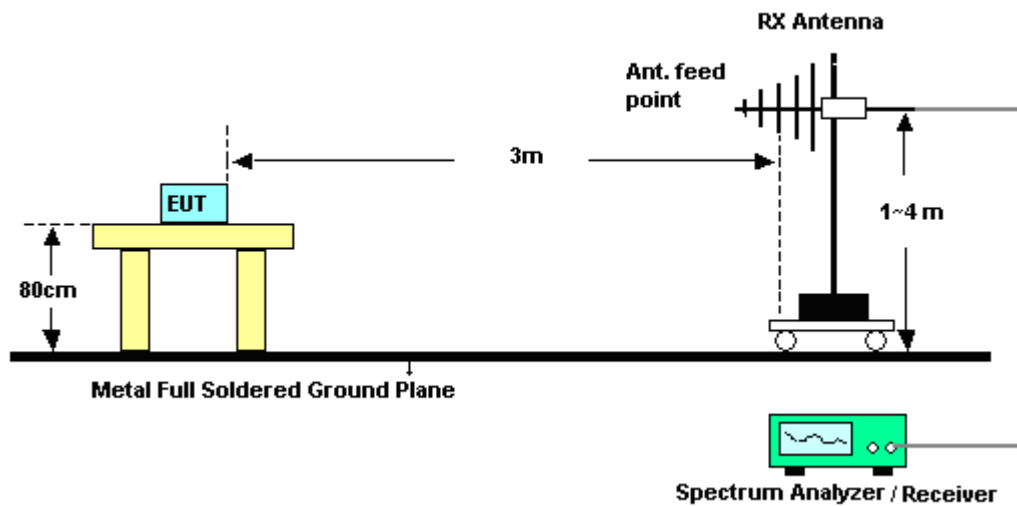
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.1.4 Test Setup

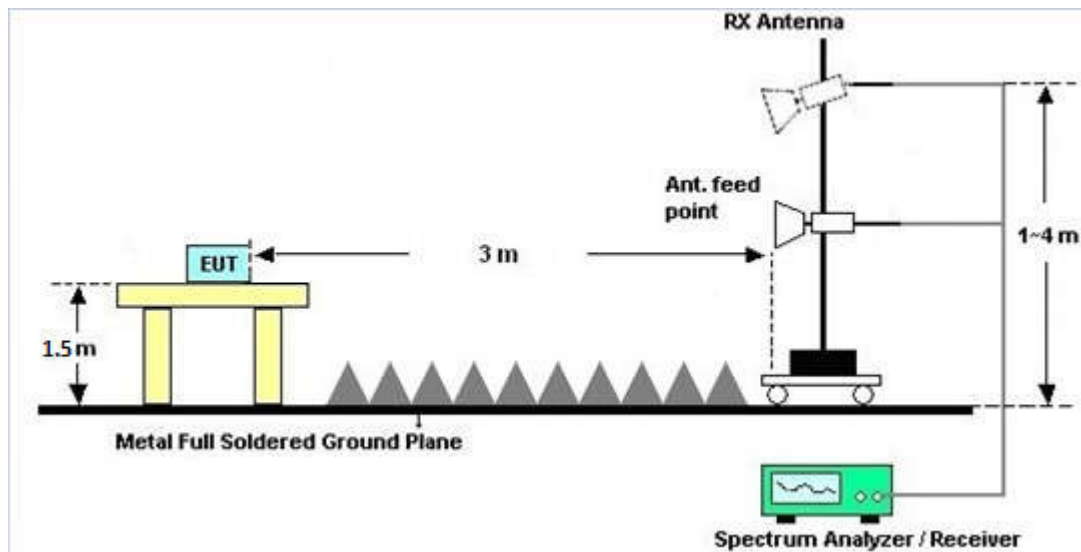
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

3.1.7 Duty Cycle

Please refer to Appendix B.

3.1.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix A.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Aug. 09, 2016	Nov. 30, 2016	Aug. 08, 2017	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY5515024 4	10Hz~44GHz	Apr. 22, 2016	Nov. 30, 2016	Apr. 21, 2017	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 23, 2016	Nov. 30, 2016	Nov. 22, 2017	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz~2GHz	Apr. 16, 2016	Nov. 30, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1356	1GHz~18GHz	Apr. 16, 2016	Nov. 30, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA17024 9	15GHz~40GHz	Mar. 03, 2016	Nov. 30, 2016	Mar. 02, 2017	Radiation (03CH03-KS)
Amplifier	SONOMA	310N	187289	9kHz~1GHz	Aug. 09, 2016	Nov. 30, 2016	Aug. 08, 2017	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	1943529	1GHz~18GHz	Jan. 20, 2016	Nov. 30, 2016	Jan. 19, 2017	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 13, 2016	Nov. 30, 2016	Oct. 12, 2017	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Nov. 30, 2016	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Nov. 30, 2016	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Nov. 30, 2016	NCR	Radiation (03CH03-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.5dB
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Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.5dB
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Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.6dB
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Appendix A. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz	*	2480	95.46	-	-	99.25	27.64	5.51	36.94	223	150	P	H
	*	2480	94.92	-	-	98.71	27.64	5.51	36.94	223	150	A	H
		2491.48	51.73	-22.27	74	55.37	27.77	5.52	36.93	223	150	P	H
		2483.5	42.8	-11.2	54	46.59	27.64	5.51	36.94	223	150	A	H
	*	2480	97.46	-	-	101.25	27.64	5.51	36.94	100	274	P	V
	*	2480	96.88	-	-	100.67	27.64	5.51	36.94	100	274	A	V
		2498.38	51.36	-22.64	74	55	27.77	5.52	36.93	100	274	P	V
		2483.5	42.29	-11.71	54	46.08	27.64	5.51	36.94	100	274	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE (Harmonics @ 3m) BLE CH 39 2480MHz		4962	42.13	-31.87	74	39.22	31.72	7.82	36.63	100	360	P	H
		7440	45.57	-28.43	74	38.03	34.44	9.87	36.77	100	360	P	H
		4962	43.26	-30.74	74	40.35	31.72	7.82	36.63	100	360	P	V
		7440	45.27	-28.73	74	37.73	34.44	9.87	36.77	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		31.94	34.76	-5.24	40	38.86	26.52	0.68	31.3	100	45	P	H
		43.58	30.39	-9.61	40	40.98	20	0.82	31.41	-	-	P	H
		63.95	25.64	-14.36	40	42.92	13.24	0.95	31.47	-	-	P	H
		158.04	24.79	-18.71	43.5	37.24	17.57	1.52	31.54	-	-	P	H
		216.24	27.12	-18.88	46	40.64	16.23	1.73	31.48	-	-	P	H
		443.22	29.16	-16.84	46	32.6	25.18	2.62	31.24	-	-	P	H
		31.94	36.37	-3.63	40	40.47	26.52	0.68	31.3	300	253	P	V
		44.55	34.22	-5.78	40	45.36	19.45	0.83	31.42	-	-	P	V
		62.01	28.8	-11.2	40	46.19	13.12	0.94	31.45	-	-	P	V
		323.91	26.47	-19.53	46	35.43	20.13	2.21	31.3	-	-	P	V
		506.27	27.04	-18.96	46	31.96	23.51	2.82	31.25	-	-	P	V
		858.38	30.56	-15.44	46	28.8	28.91	3.74	30.89	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	P eak or A verage
H/V	H orizontal or V ertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

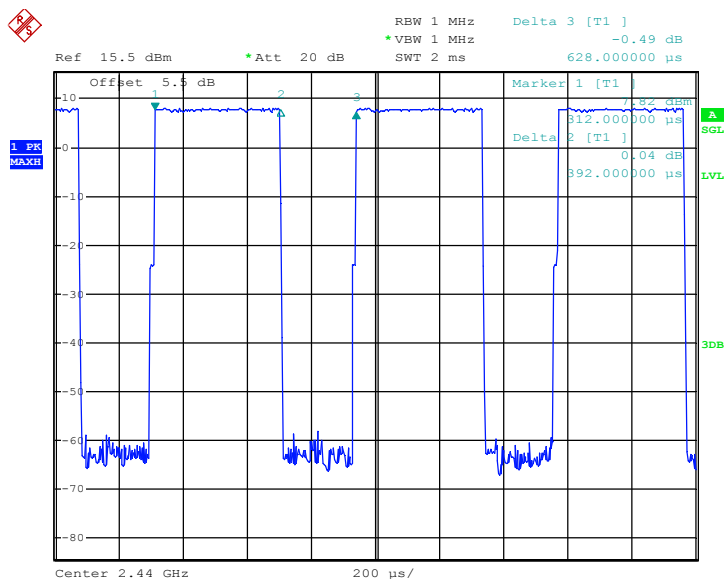
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth 4.1 LE	62.42	0.39	2.55	3kHz

Bluetooth 4.1 LE





Appendix D. Product Equality Declaration

ZTE CORPORATION**Product Change Description**

As the applicant of the below model, [ZTE Corporation] declares that the product,

[Z988]

[ZTE Corporation]

FCC ID: SRQ-Z988

is the variant of the initial certified product,

[Z988]

[ZTE Corporation]

FCC ID: SRQ-Z988

[Project Number:16ZTE387]

SOFTWARE MODIFICATIONS:

Protocol Stack changes: NO

MMS/STK changes: NO

JAVA changes: NO

Other changes detailed: NO

HARDWARE MODIFICATION:

Band changes: NO

Power Amplifier changes: NO

Antenna changes: Yes, ZTE updated antenna design to let it easy to MP. Though Antenna is updated, no pattern or gain changed.

PCB Layout changes: NO

Components on PCB changes: NO

LCD changes: Yes, new vendor, and Touch pad is also updated to new vendor.

Speaker changes: NO

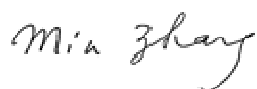
Camera changes: NO
Vibrator changes: NO
Bluetooth changes: NO
FM changes: NO
Other changes: NO

MECHANICAL MODIFICATIONS:

Use new metal front/back cover or keypad: NO
Mechanical shell changes: NO
Other changes detailed: NO

ACCESSORY MODIFICATIONS:

Battery changes:NO
AC Adaptor changes:NO
Earphone changes:NO



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