

FCC TEST REPORT**FCC Part 22 /Part 24****Report Reference No.....: LCS200615056AEB****FCC ID.....: 2AJ6DTODAAIR4G****Date of Issue.....: August 03, 2020****Testing Laboratory Name.....: Shenzhen LCS Compliance Testing Laboratory Ltd.**Address.....: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Shajing Street,
Baoan District, Shenzhen, China**Applicant's name.....: Jiangmen Todaair Electronics Co., Ltd**Address.....: F6. Electronic Building No.1 Guangdeli Steet Peng Jiang District,
Jiangmen, Guangdong, China**Test specification.....:**Standard.....: **FCC Part 22: Public Mobile Services****FCC Part 24: Personal Communication Services**

Test Report Form No: LCSEMC-1.0

TRF Originator.....: Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF.....: Dated 2011-03

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Test item description.....: 4G Router/4G LTE/Wireless Router

Trade Mark.....: TODAAIR

Model/Type reference.....: TD954G2

Adapter parameter:

Ratings.....: Input: AC 100-240V, 50/60Hz, 0.5A

Output: DC 24V, 0.5A

Hardware version.....: TD-95

Software version: TD-95

Frequency.....: GSM 850MHz; PCS 1900MHz

Result.....: **PASS****Compiled by:**

Jack Liu / File administrators

Supervised by:

Jin Wang / Technique principal

Approved by:

Gavin Liang/ Manager

TEST REPORT**Test Report No. : LCS200615056AEB**

August 03, 2020

Date of issue

Equipment under Test : 4G Router/4G LTE/Wireless Router

Model /Type : TD954G2

Applicant : Jiangmen Todaair Electronic Co.,LtdAddress : F6. Electronic Building No.1 Guangdeli Steet Peng Jiang District,
Jiangmen, Guangdong, China**Manufacturer : Jiangmen Todaair Electronics Co., Ltd**Address : F6. Electronic Building No.1 Guangdeli Steet Peng Jiang District,
Jiangmen, Guangdong, China**Factory : Jiangmen Todaair Electronics Co., Ltd**Address : F6. Electronic Building No.1 Guangdeli Steet Peng Jiang District,
Jiangmen, Guangdong, China**Test Result:****PASS**

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.

Revision History

Revision	Issue Date	Revisions	Revised By
000	August 03, 2020	Initial Issue	Gavin Liang

Contents

1	TEST STANDARDS	5
2	SUMMARY	6
2.1	General Remarks	6
2.2	Product Description	6
2.3	Equipment under Test	8
2.4	Short description of the Equipment under Test (EUT)	8
2.5	Internal Identification of AE used during the test	8
2.6	Normal Accessory setting	8
2.7	EUT configuration	9
2.8	Related Submittal(s) / Grant (s)	9
2.9	Modifications	9
2.10	General Test Conditions/Configurations	9
3	TEST ENVIRONMENT	10
3.1	Address of the test laboratory	10
3.2	Test Facility	10
3.3	Environmental conditions	10
3.4	Test Description	10
3.5	Equipments Used during the Test	12
3.6	Measurement uncertainty	13
4	TEST CONDITIONS AND RESULTS	14
4.1	Output Power	14
4.2	Radiated Spurious Emssion	18
4.3	Occupied Bandwidth and Emission Bandwidth	22
4.4	Band Edge Complicance	25
4.5	Spurious Emssion on Antenna Port	28
4.6	Frequency Stability Test	38
4.7	Peak-to-Average Ratio (PAR)	41
5	TEST SETUP PHOTOGRAPHS OF EUT	44
6	EXTERIOR PHOTOGRAPHS OF THE EUT	44
7	INTERIOR PHOTOGRAPHS OF THE EUT	44

1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 22 \(10-1-16 Edition\)](#): Cellular Radiotelephone Service.

[FCC Part 24\(10-1-16 Edition\)](#): Broadband PCS.

[ANSI/TIA-603-E-2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[47 CFR FCC Part 15 Subpart B](#): Unintentional Radiators.

[FCC Part 2](#): Frequency Allocations And Radio Treaty Matters: General Rules And Regulations.

[ANSI C63.4:2014](#): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	June 28, 2020
Testing commenced on	:	June 28, 2020
Testing concluded on	:	July 15, 2020

2.2 Product Description

The **Jiangmen Todaair Electronics Co., Ltd**'s Model: X or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

EUT	:	4G Router/4G LTE/Wireless Router
Test Model	:	TD954G2
Additional Model No.	:	TD4G38, TD954G, TD-GPRS-1MW, TD4GAC2, TD-RW3F-AM, TD-RW3G-AM, TD-RW3G-AMZ, TD-RW5G-AM, TD-RW5G-AMZ, TD4G32
Model declaration	:	PCB board, structure and internal of these model(s) are the same,
Power Supply	:	Adapter parameter: Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 24V, 0.5A
Hardware Version	:	TD-95
Software Version	:	TD-95
2G	:	
Support Band	:	<input type="checkbox"/> GSM 900 (EU-Band) <input type="checkbox"/> DCS 1800 (EU-Band) <input checked="" type="checkbox"/> GSM 850 (U.S.-Band) <input checked="" type="checkbox"/> PCS 1900 (U.S.-Band)
Release Version	:	R99
GPRS Class	:	Class 12
EGPRS Class	:	Class 12
Type Of Modulation	:	GMSK for GSM/GPRS; 8PSK for EGPRS
Antenna Description	:	PIFA Antenna; -1.43dBi (max.) For GSM 850; 1.75dBi (max.) For PCS 1900.
3G	:	
Support Band	:	<input checked="" type="checkbox"/> WCDMA Band II (U.S.-Band) <input checked="" type="checkbox"/> WCDMA Band V (U.S.-Band) <input checked="" type="checkbox"/> WCDMA Band IV (U.S.-Band) <input type="checkbox"/> WCDMA Band I (EU-Band) <input type="checkbox"/> WCDMA Band VIII (EU-Band)
Release Version	:	R8
Type Of Modulation	:	WCDMA: QPSK; HSDPA/HSUPA: QPSK
Antenna Description	:	PIFA Antenna; 1.75dBi (max.) For WCDMA Band II; 1.46dBi (max.) For WCDMA Band IV; -1.43dBi (max.) For WCDMA Band V.
LTE	:	

Support Band : ☒ E-UTRA Band 2(U.S.-Band)
☒ E-UTRA Band 4(U.S.-Band)
☒ E-UTRA Band 5(U.S.-Band)
☒ E-UTRA Band 12(U.S.-Band)
☒ E-UTRA Band 13(U.S.-Band)
☒ E-UTRA Band 14(U.S.-Band)
☒ E-UTRA Band 66(U.S.-Band)
☒ E-UTRA Band 71(U.S.-Band)

LTE Release Version : R13

Type Of Modulation : QPSK/16QAM

Antenna Description : PIFA Antenna;
1.75dBi (max.) For E-UTRA Band 2;
1.46dBi (max.) For E-UTRA Band 4;
-1.43dBi (max.) For E-UTRA Band 5;
-1.73dBi (max.) For E-UTRA Band 12;
-0.35dBi (max.) For E-UTRA Band 13;
0.60dBi (max.) For E-UTRA Band 14;
1.46dBi (max.) For E-UTRA Band 66;
-1.73dBi (max.) For E-UTRA Band 71.

Power Class : Class 3

WIFI(2.4G Band) :

Frequency Range : 2412MHz ~ 2462MHz

Channel Spacing : 5MHz

Channel Number : 11 Channel for 20MHz bandwidth(2412~2462MHz)
9 channels for 40MHz bandwidth(2422~2452MHz)

Modulation Type : 802.11b: DSSS; 802.11g/n: OFDM

Antenna Description : PIFA Antenna, 5.0dBi(Max.)

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input checked="" type="radio"/> 24 V DC
		<input type="radio"/> Other (specified in blank below)	

Test frequency list

Test Mode	TX/RX	RF Channel		
		Low(L)	Middle (M)	High (H)
GSM850	TX	Channel 128	Channel 190	Channel 251
		824.2 MHz	836.6 MHz	848.8 MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2 MHz	881.6 MHz	893.8 MHz
Test Mode	TX/RX	RF Channel		
		Low(L)	Middle (M)	High (H)
GSM1900	TX	Channel 512	Channel 661	Channel 810
		1850.2 MHz	1880.0 MHz	1909.8 MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz

2.4 Short description of the Equipment under Test (EUT)

2.4.1 General Description

4G Router/4G LTE/Wireless Router is subscriber equipment in the 2.4WIFI/GSM/ WCDMA/ LTE system. GSM/GPRS/EGPRS frequency band is Band II/IV. The HSPA/UMTS frequency band is Band II/IV/V. LTE frequency band is band 2/4/5/12/13/14/66/71. The HSPA/UMTS frequency band II and Band V test data included in this report. The 4G Router/4G LTE/Wireless Router implements such functions as RF signal receiving/transmitting, GSM/GPRS/EGPRS/ HSPA/UMTS/LTE protocol processing, video MMS service and etc. Externally it provides SIM card interface.

2.5 Internal Identification of AE used during the test

Manufacturer	Description	Model	Serial Number	Certificate
Great	AC/DC Adapter	GRT-240050	2006010475	FCC SDOC
Lenovo	ADAPTER for Notebook	ADP-90DD B	36001941	FCC ID
Lenovo	Notebook	B470	WB05067151	FCC ID

2.6 Normal Accessory setting

Fully charged battery was used during the test.

2.7 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 :	/
○ Multimeter	Manufacturer :	/
	Model No. :	/

2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AJ6DTODAAIR4G** filing to comply with FCC Part 22 and Part 24 Rules.

2.9 Modifications

No modifications were implemented to meet testing criteria.

2.10 General Test Conditions/Configurations

2.10.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
GSM/TM1	GSM system, GSM, GMSK modulation
GSM/TM2	GSM system, GPRS, GMSK modulation
GSM/TM3	GSM system, EDGE, GMSK/8PSK modulation

Note:

- As GSM and GPRS with the same emission designator, test result recorded in this report at the worst case GSM/TM1 only after exploratory scan.

2.10.2 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	DC 20.4V
	VN	DC 24.0V
	VH	DC 27.6V

NOTE: VL=lower extreme test voltage VN=nominal voltage
VH=upper extreme test voltage TN=normal temperature

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen LCS Compliance Testing Laboratory Ltd

101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Shajing Street, Baoan District, Shenzhen, China
The sites are constructed in conformance with the requirements of ANSI C63.4 (2014) and CISPR Publication 22.

3.2 Test Facility

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

FCC Registration Number. is 254912.
Industry Canada Registration Number. is 9642A.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001
NVLAP Registration Code is 600167-0

3.3 Environmental conditions

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

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

3.4 Test Description

3.4.1 Cellular Band (824-849MHz paired with 869-894MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913	FCC: ERP ≤ 7W. ISED: ERP ≤ 11.5W.	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §22.917	≤-13dBm/1%*EBW, in 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	≤ -13dBm/100kHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	≤ -13dBm/100kHz.	Pass
Frequency Stability	§2.1055, §22.355	≤ ±2.5ppm.	Pass
Peak-Average Ratio	§22.913	IC:Limit≤13dB	Pass
Receiver Spurious Emissions	N/A	--	Pass

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested".

3.4.2 PCS Band (1850-1910MHz paired with 1930-1990MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §24.232	EIRP \leq 2W	Pass
Peak-Average Ratio	§2.1046, §24.232	\leq 13dB	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §24.238	\leq -13dBm/1%*EBW, In 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238	\leq -13dBm/1MHz, from 9kHz to10th harmonics but outside authorized Operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238	\leq -13dBm/1MHz.	Pass
Frequency Stability	§2.1055, §24.235	\leq \pm 2.5ppm.	Pass
Peak-Average Ratio	§24.232	IC:Limit \leq 13dB	Pass
Receiver Spurious Emissions	N/A	--	Pass
NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested".			

Remark: 1. The measurement uncertainty is not included in the test result.

3.5 Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2020-06-22	2021-06-21
2	Power Sensor	R&S	NRV-Z81	100458	2020-06-22	2021-06-21
3	Power Sensor	R&S	NRV-Z32	10057	2020-06-22	2021-06-21
4	LTE Test Software	Tonscend	JS1120-1	N/A	N/A	N/A
5	RF Control Unit	Tonscend	JS0806	158060009	2020-06-22	2021-06-21
6	MXA Signal Analyzer	Agilent	N9020A	MY51250905	2019-11-12	2020-11-21
7	WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	103818	2020-06-22	2021-06-21
8	DC Power Supply	Agilent	E3642A	N/A	2019-11-14	2020-11-13
9	EMI Test Software	EZ	EZ-EMC	N/A	N/A	N/A
10	3m Full Anechoic Chamber	MRDIANZI	FAC-3M	MR009	2019-09-27	2020-09-26
11	Positioning Controller	MF	MF7082	MF78020803	2020-06-22	2021-06-21
12	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018-07-26	2021-07-25
13	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
14	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2021-07-01
15	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2017-09-21	2020-09-20
16	Broadband Preamplifier	SCHWARZBECK	BBV9745	9719-025	2020-06-22	2021-06-21
17	EMI Test Receiver	R&S	ESR 7	101181	2020-06-22	2021-06-21
18	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2019-11-14	2020-11-13
19	Broadband Preamplifier	/	BP-01M18G	P190501	2020-06-22	2021-06-21
20	RF Cable-R03m	Jye Bao	RG142	CB021	2020-06-22	2021-06-21
21	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2020-06-22	2021-06-21
22	6dB Attenuator	/	100W/6dB	1172040	2020-06-22	2021-06-21
23	3dB Attenuator	/	2N-3dB	/	2020-06-22	2021-06-21
24	Temperature & Humidity Chamber	GUANGZHOU GOGNWN	GDS-100	70932	2019-10-09	2020-10-08

Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.

3.6 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 ETSI TR 100 028 " Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen LCS Compliance Testing Laboratory 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 LCS Compliance Testing Laboratory Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.80 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occupied Bandwidth	9KHz~40GHz	-	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4 TEST CONDITIONS AND RESULTS

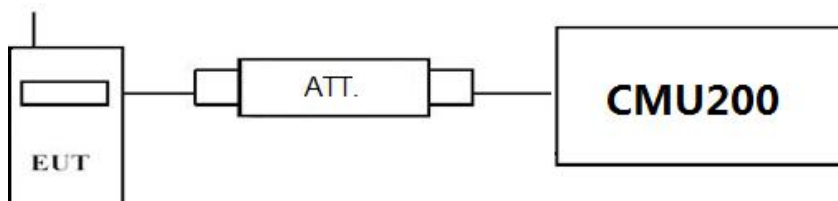
4.1 Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMU200) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

4.1.1 Conducted Output Power

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a CMU200 by an Att.
- EUT Communicate with CMU200 then selects a channel for testing.
- Add a correction factor to the display CMU200, and then test.

TEST RESULTS

GSM 850		Burst Average Conducted power (dBm)		
		Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8
GSM		32.65	32.70	32.68
GPRS (GMSK)	1TX slot	32.53	32.53	32.48
	2TX slot	30.97	31.00	30.95
	3TX slot	29.47	29.52	29.49
	4TX slot	28.01	27.98	27.99
EDGE (8PSK)	1TX slot	26.01	25.99	25.98
	2TX slot	24.48	24.50	24.47
	3TX slot	22.96	23.01	22.93
	4TX slot	21.46	21.51	21.47

GSM 1900		Burst Average Conducted power (dBm)		
		Channel/Frequency(MHz)		
		512/1850.2	661/1880	810/1909.8
GSM		29.69	29.73	29.67
GPRS (GMSK)	1TX slot	29.54	29.55	29.50
	2TX slot	27.96	27.99	27.94
	3TX slot	26.46	26.48	26.44
	4TX slot	24.98	25.03	24.97
EDGE (8PSK)	1TX slot	25.49	25.49	25.45
	2TX slot	24.00	23.99	23.97
	3TX slot	22.50	22.53	22.44
	4TX slot	20.98	20.97	20.92

4.1.2 Radiated Output Power

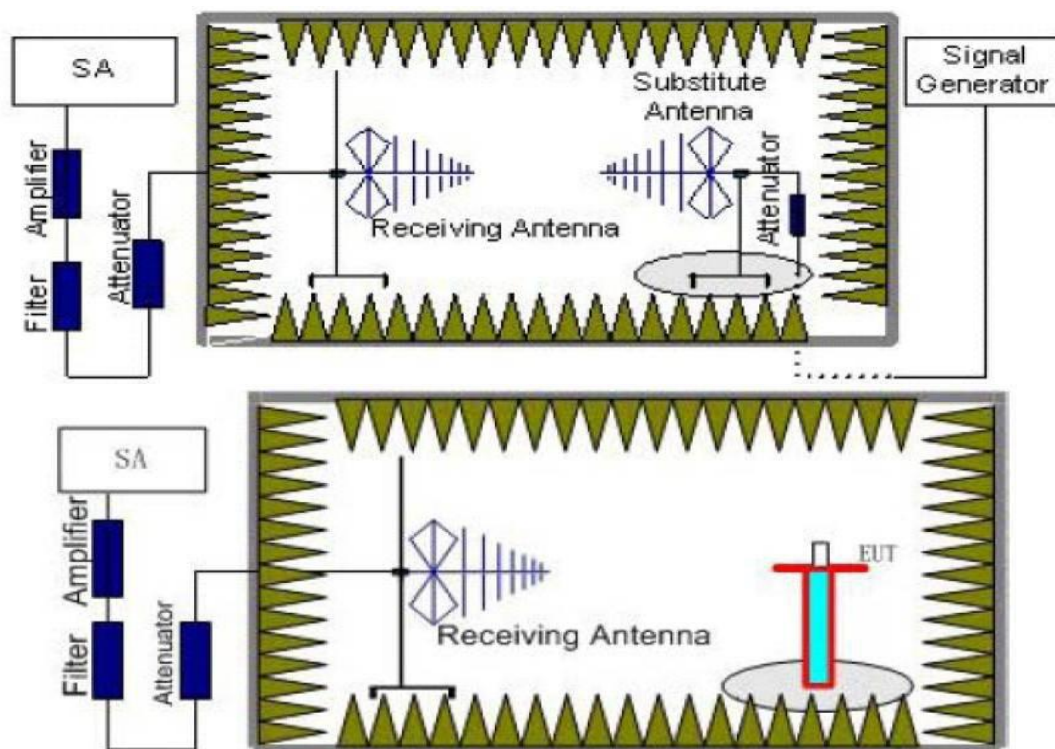
TEST DESCRIPTION

This is the test for the maximum radiated power from the EUT.

Per rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(e) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Per rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the

previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.

TEST LIMIT

According to 22.913(a), 24.232(c), the ERP should be not exceed following table limits:

GSM850(GPRS850,EDGE850)		
Function	Power Step	Burst Peak ERP (dBm)
GSM	5	FCC: $\leq 38.45\text{dBm}$ (7W)
GPRS	3	FCC: $\leq 38.45\text{dBm}$ (7W)
EDGE	8	FCC: $\leq 38.45\text{dBm}$ (7W)

PCS1900(GPRS1900,EDGE1900)		
Function	Power Step	Burst Peak EIRP (dBm)
GSM	0	$\leq 33.01\text{dBm}$ (2W)
GPRS	3	$\leq 33.01\text{dBm}$ (2W)
EDGE	2	$\leq 33.01\text{dBm}$ (2W)

TEST RESULTS

Remark:

- We were tested all Configuration refer 3GPP TS151 010.
- $\text{EIRP} = P_{Mea}(\text{dBm}) - P_{cl}(\text{dB}) + P_{Ag}(\text{dB}) + G_a(\text{dBi})$
- $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ as EIRP by subtracting the gain of the dipole.
- Margin = Emission Level - Limit
- We test the H direction and V direction recorded worst case.

GSM/TM1/GSM850

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	Burst Average ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.20	-6.99	3.45	8.45	2.15	33.79	29.65	38.45	-8.80	V
836.60	-6.94	3.49	8.45	2.15	33.85	29.72	38.45	-8.73	V
848.80	-6.96	3.55	8.36	2.15	33.88	29.58	38.45	-8.87	V

GSM/TM3/EDGE850

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	Burst Average ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.20	-12.00	3.45	8.45	2.15	33.79	24.64	38.45	-13.81	V
836.60	-12.07	3.49	8.45	2.15	33.85	24.59	38.45	-13.86	V
848.80	-11.96	3.55	8.36	2.15	33.88	24.58	38.45	-13.87	V

GSM/TM1/GSM1900

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.20	-11.91	4.03	8.38	35.51	27.95	33.01	-5.06	V
1880.00	-12.08	4.08	8.33	35.56	27.73	33.01	-5.28	V
1909.80	-12.00	4.14	8.26	35.63	27.75	33.01	-5.26	V

GSM/TM3/EDGE1900

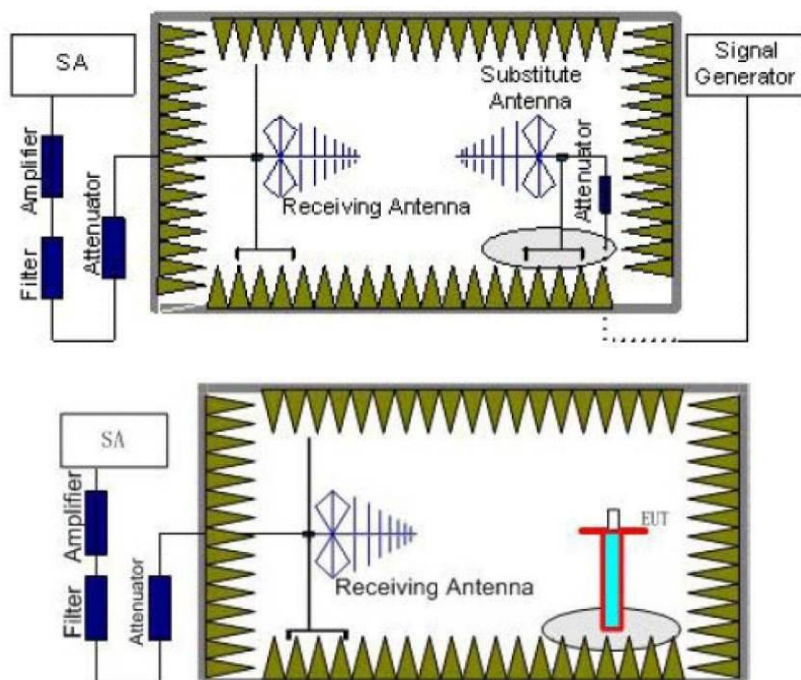
Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.20	-17.08	4.03	8.38	35.51	22.78	33.01	-10.23	V
1880.00	-16.92	4.08	8.33	35.56	22.89	33.01	-10.12	V
1909.80	-16.98	4.14	8.26	35.63	22.77	33.01	-10.24	V

4.2 Radiated Spurious Emission

TEST APPLICABLE

According to the TIA/EIA 603D:2010 and FCC Part 2.1033 test method, The Receiver or Spectrum was scanned from lowest frequency frequency generated within the equipment to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238, Part 22.917, RSS-132 §5.5 and RSS-133 §6.5. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{\text{Mea}} + P_{\text{Ag}} - P_{\text{cl}} + G_a$$

6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.
8. In order to make sure test results more clearly, we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
TM1/GSM 850	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3
TM1/GSM 1900	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
	18~20	1 MHz	3 MHz	2

TEST LIMITS

According to 24.238 and 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Frequency	Channel	Frequency Range	Verdict
TM1/GSM 850	Low	9KHz -10GHz	PASS
	Middle	9KHz -10GHz	PASS
	High	9KHz -10GHz	PASS
TM1/GSM 1900	Low	9KHz -20GHz	PASS
	Middle	9KHz -20GHz	PASS
	High	9KHz -20GHz	PASS

TEST RESULTS

Remark:

1. We were tested all refer 3GPP TS151 010.
2. $\text{EIRP} = P_{\text{Mea}}(\text{dBm}) - P_{\text{cl}}(\text{dB}) + G_a(\text{dBi})$
3. We were not recorded other points as values lower than limits.
4. $\text{Margin} = \text{EIRP} - \text{Limit}$

GSM/TM1/GSM850_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1648.40	-42.97	3.86	3.00	8.56	-38.27	-13.00	-25.27	H
2472.60	-44.18	4.29	3.00	6.98	-41.49	-13.00	-28.49	H
1648.40	-39.44	3.86	3.00	8.56	-34.74	-13.00	-21.74	V
2472.60	-42.34	4.29	3.00	6.98	-39.65	-13.00	-26.65	V

GSM/TM1/GSM850_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.20	-41.63	3.9	3.00	8.58	-36.95	-13.00	-23.95	H
2509.80	-46.67	4.32	3.00	6.8	-44.19	-13.00	-31.19	H
1673.20	-37.62	3.9	3.00	8.58	-32.94	-13.00	-19.94	V
2509.80	-42.72	4.32	3.00	6.8	-40.24	-13.00	-27.24	V

GSM/TM1/GSM850_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1697.60	-47.20	3.91	3.00	9.06	-42.05	-13.00	-29.05	H
2546.40	-49.67	4.32	3.00	6.65	-47.34	-13.00	-34.34	H
1697.60	-43.24	3.91	3.00	9.06	-38.09	-13.00	-25.09	V
2546.40	-44.89	4.32	3.00	6.65	-42.56	-13.00	-29.56	V

GSM/TM3/GSM850_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1648.40	-45.41	3.86	3.00	8.56	-40.71	-13.00	-27.71	H
2472.60	-46.49	4.29	3.00	6.98	-43.80	-13.00	-30.80	H
1648.40	-42.09	3.86	3.00	8.56	-37.39	-13.00	-24.39	V
2472.60	-43.69	4.29	3.00	6.98	-41.00	-13.00	-28.00	V

GSM/TM3/GSM850_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.20	-44.11	3.9	3.00	8.58	-39.43	-13.00	-26.43	H
2509.80	-48.71	4.32	3.00	6.8	-46.23	-13.00	-33.23	H
1673.20	-39.29	3.9	3.00	8.58	-34.61	-13.00	-21.61	V
2509.80	-44.72	4.32	3.00	6.8	-42.24	-13.00	-29.24	V

GSM/TM3/GSM850_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1697.60	-49.17	3.91	3.00	9.06	-44.02	-13.00	-31.02	H
2546.40	-51.71	4.32	3.00	6.65	-49.38	-13.00	-36.38	H
1697.60	-45.07	3.91	3.00	9.06	-39.92	-13.00	-26.92	V
2546.40	-47.37	4.32	3.00	6.65	-45.04	-13.00	-32.04	V

GSM/TM1/GSM1900_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3700.40	-45.52	5.26	3.00	9.88	-40.90	-13.00	-27.90	H
5550.60	-46.24	6.11	3.00	11.36	-40.99	-13.00	-27.99	H
3700.40	-41.93	5.26	3.00	9.88	-37.31	-13.00	-24.31	V
5550.60	-43.61	6.11	3.00	11.36	-38.36	-13.00	-25.36	V

GSM/TM1/GSM1900_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.00	-43.69	5.32	3.00	10.03	-38.98	-13.00	-25.98	H
5640.00	-48.06	6.19	3.00	11.41	-42.84	-13.00	-29.84	H
3760.00	-39.36	5.32	3.00	10.03	-34.65	-13.00	-21.65	V
5640.00	-44.78	6.19	3.00	11.41	-39.56	-13.00	-26.56	V

GSM/TM1/GSM1900_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3819.60	-49.14	5.36	3.00	9.62	-44.88	-13.00	-31.88	H
5729.40	-51.79	6.24	3.00	11.46	-46.57	-13.00	-33.57	H
3819.60	-45.04	5.36	3.00	9.62	-40.78	-13.00	-27.78	V
5729.40	-46.68	6.24	3.00	11.46	-41.46	-13.00	-28.46	V

GSM/TM3/GSM1900_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3700.40	-47.49	5.26	3.00	9.88	-42.87	-13.00	-29.87	H
5550.60	-48.26	6.11	3.00	11.36	-43.01	-13.00	-30.01	H
3700.40	-44.09	5.26	3.00	9.88	-39.47	-13.00	-26.47	V
5550.60	-46.10	6.11	3.00	11.36	-40.85	-13.00	-27.85	V

GSM/TM3/GSM1900_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.00	-45.89	5.32	3.00	10.03	-41.18	-13.00	-28.18	H
5640.00	-50.01	6.19	3.00	11.41	-44.79	-13.00	-31.79	H
3760.00	-41.57	5.32	3.00	10.03	-36.86	-13.00	-23.86	V
5640.00	-47.37	6.19	3.00	11.41	-42.15	-13.00	-29.15	V

GSM/TM3/GSM1900_High Channel

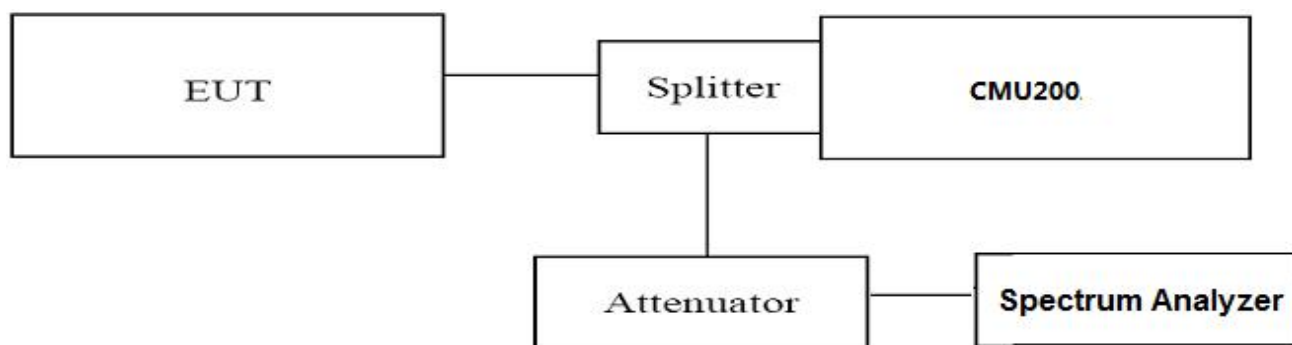
Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3819.60	-51.11	5.36	3.00	9.62	-46.85	-13.00	-33.85	H
5729.40	-53.19	6.24	3.00	11.46	-47.97	-13.00	-34.97	H
3819.60	-47.16	5.36	3.00	9.62	-42.90	-13.00	-29.90	V
5729.40	-49.16	6.24	3.00	11.46	-43.94	-13.00	-30.94	V

4.3 Occupied Bandwidth and Emission Bandwidth

TEST APPLICABLE

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of PCS1900 band and GSM850 band. The table below lists the measured 99% Bandwidth and -26dBc Bandwidth.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was set up for the max output power with pseudo random data modulation;
2. The Occupied bandwidth and Emission Bandwidth were measured with Spectrum Analyzer N9020A;
3. Set RBW=5.1KHz, VBW=51KHz, Span=1MHz, SWT=Auto;
4. Set SPA Max hold and View, Set 99% Occupied Bandwidth/ Set -26dBc Occupied Bandwidth
5. These measurements were done at 3 frequencies, 1850.20 MHz, 1880.00 MHz and 1909.80 MHz for PCS1900 band; 824.20MHz, 836.60 MHz and 848.80 MHz for GSM850 band. (Low, middle and high of operational frequency range).

TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Occupied Bandwidth (99% BW) (KHz)	Emission Bandwidth (-26 dBc BW) (KHz)	Verdict
GSM/TM1 /GSM850	128	824.2	246.0	307	PASS
	190	836.6	240.8	307	PASS
	251	848.8	245.3	309	PASS
GSM/TM3 /EDGE850	128	824.2	248.0	312	PASS
	190	836.6	247.3	312	PASS
	251	848.8	251.3	314	PASS
GSM/TM1 /GSM1900	512	1850.2	244.2	302	PASS
	661	1880.0	246.6	303	PASS
	810	1909.8	244.2	302	PASS
GSM/TM3 /EDGE1900	512	1850.2	245.4	314	PASS
	661	1880.0	243.0	306	PASS
	810	1909.8	241.4	303	PASS

Remark:

1. Test results including cable loss;
2. Please refer to following plots;