# **TEST REPORT**

**Reference No.** ..... : WTS15S0628457-3E

FCC ID ..... : 2AEE8LAVASTARPLUS

Applicant...... : LAVA INTERNATIONAL (H.K) LIMITED

Address.....: UNIT L 1/F MAU LAM COMM BLDG 16-18 MAU LAM ST, JORDAN

KL, HK

Manufacturer ...... : The same as above

Address ...... The same as above

Product Name..... : mobile phone

Model No. ..... : Star Plus

Brand.....: LAVA

Standards..... FCC CFR47 Part 22 Subpart H:2014

FCC CFR47 Part 24 Subpart E:2014

Date of Receipt sample .... : Jun. 24, 2015

Test Result..... Pass

#### Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

# Prepared By: Waltek Services (Shenzhen) Co., Ltd.

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Compiled by:

Approved by

Philo Zhong / Manager

Zero Zhou / Project Engineer

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# 2 Test Summary

Test Items	Test Requirement	Result			
	2.1046				
RF Output Power	22.913 (a)	PASS			
	24.232 (c)				
Peak-to-Average Ratio	24.232 (d)	PASS			
	2.1049				
Dondwidth	22.905	DACC			
Bandwidth	22.917	PASS			
	24.238				
	2.1051				
Spurious Emissions at Antenna Terminal	enna Terminal 22.917 (a)				
	24.238 (a)				
	2.1053				
Field Strength of Spurious Radiation	22.917 (a)	PASS			
	24.238 (a)				
Out of band emission	22.917 (a)	DACC			
Out of band emission	24.238 (a)	PASS			
	2.1055				
Frequency Stability	Frequency Stability 22.355				
	24.235				
Maximum Permissible Exposure	1.1307	DACC			
(SAR)	2.1093	PASS			

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#### **General Information** 4

#### 4.1 **General Description of E.U.T.**

: mobile phone **Product Name** : Star Plus Model No.

Model Description : N/A

: GSM 850/900/1800/1900MHz GSM Band(s)

**GPRS/EGPRS Class** : 12

: FDD Band I/II/V WCDMA Band(s) : LTE Band 2/4/7 LTE Bnad(s)

: 802.11b/g/n HT20/n HT40 Wi-Fi Specification

: Bluetooth v4.0 with BLE Bluetooth Version

**GPS** : Support

**NFC** : N/A

Hardware Version : V2.0

Software Version : S101

#### 4.2 Details of E.U.T.

: GSM/GPRS/EGPRS 850: 824~849MHz **Operation Frequency** 

PCS/GPRS/EGPRS1900: 1850~1910MHz

WCDMA Band II: 1850-1910MHz WCDMA Band V: 824~849MHz LTE Band 2: 1850~1910MHz LTE Band 4: 1710~1755MHz LTE Band 7: 2500~2570MHz

WiFi:

802.11b/g/n HT20: 2412-2462MHz 802.11n HT40: 2422-2452MHz Bluetooth: 2402-2480MHz

: GSM 850: 32.67dBm Max. RF output power

> EGPRS 850: 25.96dBm PCS1900:29.66dBm EGPRS 1900:25.78dBm WCDMA Band II: 22.73dBm WCDMA Band V: 22.42dBm LTE Band 2: 23.69dBm LTE Band 4: 23.99dBm

LTE Band 7: 23.87dBm WiFi: 9.44dBm

Bluetooth: 2.75dBm

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Type of Modulation : GSM,GPRS: GMSK

EGPRS: GMSK, 8PSK

WCDMA: BPSK

LTE: QPSK, 16QAM WiFi: CCK, OFDM

Bluetooth: GFSK, Pi/4 DQPSK,8DPSK

Antenna installation : GSM/WCDMA/LTE: internal permanent antenna

WiFi/Bluetooth: internal permanent antenna

Antenna Gain : GSM 850: 1.0dBi

PCS1900: 1.0dBi

WCDMA Band II: 1.0dBi WCDMA Band V: 1.0dBi LTE Band 2: 1.0dBi LTE Band 4: 1.0dBi LTE Band 7: 1.0dBi

WiFi: 0dBi

Bluetooth: 0dBi

Technical Data :Battery DC 3.8V, 2500mAh

DC 5V,1A, Charging form adapter

Adapter Input:100-300V~50/60Hz, 0.15A

Adapter :Manufacture: LAVA

Model No.: CLV-14

Type of Emission : GSM850: 248KGXW, PCS1900: 246KGXW

EGPRS850:248KG7W,EGPRS1900:245KG7W WCDMA850: 4M26F9W, WCDMA1900: 4M26F9W Reference No.: WTS15S0628457-3E Page 6 of 47

#### 4.3 **Test Mode**

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by

performing full tests, the worst data were recorded and reported.

Support Band	Test Mode	Channel Frequency	Channel Number
		824.2 MHz	128
GSM 850	GSM/GPRS/EGPRS	836.6 MHz	190
		848.8 MHz	251
		1850.2 MHz	512
PCS 1900	GSM/GPRS/EGPRS	1880.0 MHz	661
		1909.8 MHz	810
		826.4 MHz	4132
WCDMA Band V	WCDMA/HSUPA/HSDPA	836.6 MHz	4183
		846.6 MHz	4233
		1852.4MHz	9262
WCDMA Band II	WCDMA/HSUPA/HSDPA	1880.0MHz	9400
		1907.6MHz	9538
Remark: All mode(s	) were tested and the worst data	was recorded.	

#### 4.4 Test Facility

The test facility has a test site registered with the following organizations:

#### IC - Registration No.: 7760A

Waltek Services(Shenzhen) Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, July 12, 2012.

#### FCC Test Site 1#- Registration No.: 880581

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, April 29, 2014.

#### FCC Test Site 2#- Registration No.: 328995

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory 'has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 328995, December 3, 2014.

# 5 Equipment Used during Test

#### 5.1 Equipments List

	5.1 Equipments L	IST				
RF Co	nducted Test					
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	Aug.15,2014	Aug.14,2015
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Aug.15,2014	Aug.14,2015
3.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	Aug.15,2014	Aug.14,2015
4.	Universal Radio Communication Tester	R&S	CMU 200	112461	Apr.10,2015	Apr.09,2016
3m Sei	mi-anechoic Chamber	for Radiated Emis	sions			
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.15,2014	Sep.14,2015
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.15,2014	Sep.14,2015
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.18,2015	Apr.17,2016
4	Coaxial Cable (below 1GHz)	Тор	TYPE16(13M)	-	Sep.15,2014	Sep.14,2015
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.18,2015	Apr.17,2016
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	669	Apr.18,2015	Apr.17,2016
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Mar.17,2015	Mar.16,2016
8	Coaxial Cable (above 1GHz)	Тор	1000MHz- 25GHz	EW02014-7	Apr.09,2015	Apr.08,2016
9	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Sep.15,2014	Sep.14,2015
10	Universal Radio Communication Tester	R&S	CMU 200	112461	Apr.10,2015	Apr.09,2016
11	Signal Generator	R&S	SMR20	100046	Sep.15,2014	Sep.14,2015

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## 5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10 <sup>-6</sup>
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions tost	± 5.03 dB (Bilog antenna 30M~1000MHz)
Radiated Spurious Emissions test	± 5.47 dB (Horn antenna 1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

## 5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

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#### 6 RF OUTPUT POWER

Test Requirement: FCC Part 2.1046,22.913 (a),24.232 (c)
Test Method: ANSI C63.4:2009, TIA/EIA-603-D:2010

Test Mode: Transmitting

#### 6.1 EUT Operation

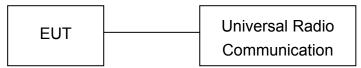
Operating Environment:

Temperature: 22.5 °C
Humidity: 52.1 % RH
Atmospheric Pressure: 101.2kPa

#### 6.2 Test Procedure

Conducted method:

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.



#### Radiated method:

- 1. The setup of EUT is according with per TIA/EIA Standard 603D and ANSI C63.4 measurement procedure.
- 2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
- 3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
- 4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

#### 6.3 Test Result

#### **Conducted Power**

Conducted Power											
	GSM -	Burst Ave	erage Pov	ver (dBm)							
Band	G	SM850		PCS1900							
Channel	128	190	251	512	661	810					
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880	1909.8					
GSM	32.57	32.67	32.56	29.65	29.43	29.23					
GPRS (1 slot)	32.51	32.57	32.51	29.66	29.46	29.26					
GPRS (2 slots)	31.64	31.67	31.43	28.78	28.69	28.61					
GPRS (3 slots)	29.69	29.71	29.65	26.87	26.89	27.03					
GPRS (4 slots)	28.65	28.66	28.51	25.82	25.85	25.79					
EGPRS (1 slot)	25.82	25.96	25.93	25.78	25.72	25.41					
EGPRS (2 slots)	24.80	24.93	24.93	24.80	24.83	24.55					
EGPRS (3 slots)	22.84	22.95	22.97	22.83	22.79	22.56					
EGPRS (4 slots)	21.85	21.98	21.94	21.78	21.71	21.88					

	WCDMA - Average Power (dBm)											
Band	WC	DMA Band	ll b	WCDMA Band V								
Channel	9262	9400	9538	4132	4183	4233						
Frequency (MHz)	1852.4	1880	1907.6	826.4	836.6	846.6						
RMC 12.2k	22.73	22.50	22.70	22.42	22.27	22.40						
HSDPA Subtest-1	21.32	21.21	21.40	21.44	21.22	21.37						
HSDPA Subtest-2	21.15	20.85	20.89	21.22	20.96	21.74						
HSDPA Subtest-3	20.97	20.91	21.34	20.84	21.04	21.80						
HSDPA Subtest-4	21.51	21.31	21.86	21.54	21.65	20.92						
HSUPA Subtest-1	21.46	21.31	21.57	21.45	21.19	21.42						
HSUPA Subtest-2	20.38	21.51	21.00	21.79	20.97	21.12						
HSUPA Subtest-3	21.35	21.49	21.79	21.12	21.53	21.29						
HSUPA Subtest-4	21.54	21.66	21.14	21.34	20.88	20.97						
HSUPA Subtest-5	21.69	21.17	21.46	21.25	21.46	21.76						

#### Radiated Power(Measured at max. conducted power channel)

#### ERP and EIRP

#### Cellular Band (Part 22H)

F	Receiver Reading	table	RX An	RX Antenna		Substituted			Part 22H Part 24E		
Frequency			Height	Polar	SG Level	Cable	Antenna Gain	Level	Limit	Margin	
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
GSM 850 Channel 190											
836.60	92.18	134	1.4	Н	25.15	0.20	0.00	24.95	38.45	-13.50	
836.60	97.49	106	2.0	V	30.39	0.20	0.00	30.19	38.45	-8.26	
	<del>,</del>		(	SPRS 85	50 Chanr	nel 190	<del>,</del>				
836.60	92.10	59	2.0	Н	25.07	0.20	0.00	24.87	38.45	-13.58	
836.60	97.85	346	1.8	V	30.75	0.20	0.00	30.55	38.45	-7.90	
			Е	DGE 85	50 Chanr	nel 190					
836.60	85.37	339	1.4	Н	18.34	0.20	0.00	18.14	38.45	-20.31	
836.60	92.65	79	1.4	V	25.55	0.20	0.00	25.35	38.45	-13.10	

Fraguesa	Receiver Reading	Turn	RX Antenna		,	Substituted			Part 22H Part 24E		
Frequency		table Angle	Height	Polar	SG Level	Cable	Antenna Gain	Level	Limit	Margin	
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
WCDMA Band V Channel 4132											
826.40	76.41	148	1.8	Н	9.38	0.20	0.00	9.18	38.45	-29.27	
826.40	84.96	288	2.0	V	17.86	0.20	0.00	17.66	38.45	-20.79	
	·		WCDMA	Band V	HSDPA	Channe	1 4233				
846.60	78.68	307	1.1	Н	11.65	0.20	0.00	11.45	38.45	-27.00	
846.60	84.63	36	1.8	V	17.53	0.20	0.00	17.33	38.45	-21.12	
			WCDMA	Band V	HSUPA	Channe	l 4132				
826.40	78.15	67	2.0	Н	11.12	0.20	0.00	10.92	38.45	-27.53	
826.40	84.47	152	1.5	V	17.37	0.20	0.00	17.17	38.45	-21.28	

Cellular Band (Part 24E)

1	Celidal Balla (Falt 24c)										
Fraguenay	Receiver	eiver Turn	RX An	tenna		Substituted				22H 24E	
Frequency	Reading	table Angle	Height	Polar	SG Level	Cable	Antenna Gain	Level	Limit	Margin	
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)	
	PCS 1900 Channel 512										
1850.20	85.71	157	1.4	Н	11.74	0.31	10.40	21.83	33	-11.17	
1850.20	92.41	108	1.5	V	19.13	0.31	10.40	29.22	33	-3.78	
			G	PRS 19	00 Chan	nel 512					
1850.20	85.72	196	1.7	Н	11.75	0.31	10.40	21.84	33	-11.16	
1850.20	92.80	234	1.4	V	19.52	0.31	10.40	29.61	33	-3.39	
			Е	DGE 19	00 Chan	nel 512					
1850.20	84.02	306	2.3	Н	10.05	0.31	10.40	20.14	33	-12.86	
1850.20	88.62	63	1.8	V	15.34	0.31	10.40	25.43	33	-7.57	

Fraguesay	Receiver	Turn	RX An	tenna	,	Substitut	ted	Absolute		: 22H : 24E		
Frequency	Reading	g table Angle	Height	Polar	SG Level	Cable	Antenna Gain	Level	Limit	Margin		
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)		
	WCDMA Band II Channel 9262											
1852.40	77.17	185	2.4	Н	3.20	0.31	10.40	13.29	33	-19.71		
1852.40	84.29	203	1.1	V	11.01	0.31	10.40	21.10	33	-11.90		
			WCDMA	Band II	HSDPA	Channe	1 9538					
1907.60	79.52	234	2.0	Н	5.79	0.32	10.40	15.87	33	-17.13		
1907.60	84.14	20	1.1	V	11.18	0.32	10.40	21.26	33	-11.74		
			WCDMA	Band II	HSUPA	Channel	9538					
1907.60	78.68	236	1.7	Н	4.95	0.32	10.40	15.03	33	-17.97		
1907.60	84.70	283	1.6	V	11.74	0.32	10.40	21.82	33	-11.18		

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#### 7 Peak-to-Average Ratio

Test Requirement: 24.232 (d)

Test Method: N/A

Test Mode: Transmitting

#### 7.1 EUT Operation

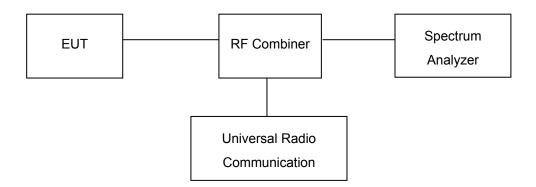
Operating Environment:

Temperature: 22.5 °C
Humidity: 52.3% RH
Atmospheric Pressure: 101.2kPa

#### 7.2 Test Procedure

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.

- 2. Set EUT to transmit at maximum output power.
- 3. When the duty cycle is less than 98%, then signal gating will be implemented on the spectrum analyzer by triggering from the system simulator.
- 4. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer. Record the maximum PAPR level associated with a probability of 0.1%.



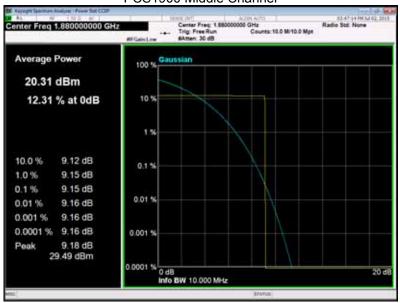
#### 7.3 Test Result

Cellular Band (Part 24E)

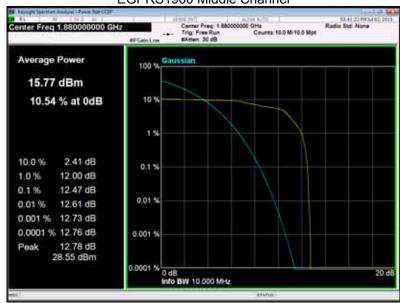
0010101 20110 (1 0112 12)											
Mode	PCS 1900			EGPRS 1900			WCDMA Band II				
Channel	512	661	810	512	661	810	9262	9400	9538	Limit	
Frequency (MHz)	1850.2	1880.0	1909.8	1850.2	1880.0	1909.8	1852.4	1880.0	1907.6	(dB)	
Peak-to- Average Ratio (dB)	9.17	9.15	9.14	12.45	12.47	12.48	2.12	2.14	2.17	13	

#### Test Plots (Part 24E)

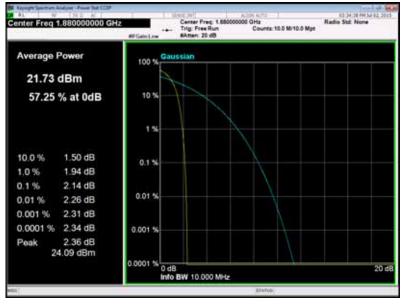
#### PCS1900 Middle Channel







#### WCDMA Band II Middle Channel



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#### 8 BANDWIDTH

Test Requirement: FCC Part 2.1049,22.917,22.905,24.238
Test Method: ANSI C63.4:2009, TIA/EIA-603-D:2010

Test Mode: Transmitting

#### 8.1 EUT Operation

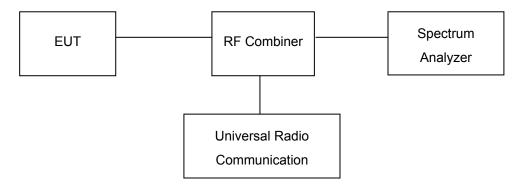
Operating Environment:

Temperature: 22.5 °C
Humidity: 52.3% RH
Atmospheric Pressure: 101.2kPa

#### 8.2 Test Procedure

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 3 kHz (Cellular /PCS) and the 26 dB & 99%bandwidth was recorded.



#### 8.3 Test Result

Cellular Band (Part 22H)

Test Mode	Channel	Frequency	99% Occupied	26 dB Emission
		(MHz)	Bandwidth(kHz)	Bandwidth(kHz)
GSM 850	128	824.2	247.49	309.62
	190	836.6	247.5	309.60
	251	848.8	247.43	309.53
GPRS 850	128	824.2	245.01	314.56
	190	836.6	245.01	314.60
	251	848.8	245.07	314.66
EGPRS 850	128	824.2	247.57	310.95
	190	836.6	247.61	310.90
	251	848.8	247.55	310.83

Т	est Mode	Channel	Frequency	99% Occupied	26 dB Emission
	<del>,</del>		(MHz)	Bandwidth(MHz)	Bandwidth(MHz)
	RMC12.2k	4132	826.4	4.15	4.821
		4183	836.6	4.22	4.848
		4233	846.6	4.25	4.862
14/00144	HSDPA(16QAM)	4132	826.4	4.20	4.893
WCDMA		4183	836.6	4.21	4.835
Band V		4233	846.6	4.24	4.823
	HSUPA(BPSK)	4132	826.4	4.26	4.805
		4183	836.6	4.21	4.816
		4233	846.6	4.15	4.774

Cellular Band (Part 24E)

	I	ai bana (i ait z		
Test Mode	Channel	Frequency	99% Occupied	26 dB Emission
		(MHz)	Bandwidth(kHz)	Bandwidth(kHz)
PCS 1900	512	1850.20	242.27	309.7
	661	1880.00	242.34	309.8
	810	1909.80	242.36	309.8
GPRS 1900	512	1850.20	246.05	314.6
	661	1880.00	246.09	314.7
	810	1909.80	246.13	314.6
EGPRS 1900	512	1850.20	245.32	305.6
	661	1880.00	245.28	305.6
	810	1909.80	245.24	305.5

Т	Test Mode		Frequency	99% Occupied	26 dB Emission
	1		(MHz)	Bandwidth(MHz)	Bandwidth(MHz)
	RMC12.2k	9262	1852.40	4.26	4.901
		9400	1880.00	4.22	4.907
		9538	1907.60	4.16	4.882
	HSDPA(16QAM)	9262	1852.40	4.21	4.891
WCDMA		9400	1880.00	4.22	4.825
Band II		9538	1907.60	4.17	4.884
	HSUPA(BPSK)	9262	1852.40	4.16	4.922
		9400	1880.00	4.21	4.843
		9538	1907.60	4.18	4.835

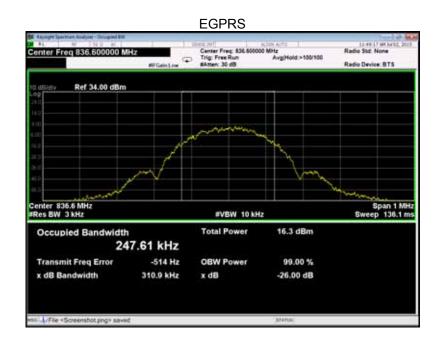
Test Plots
Cellular Band (Part 22H)



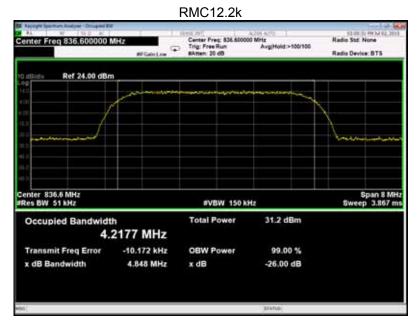


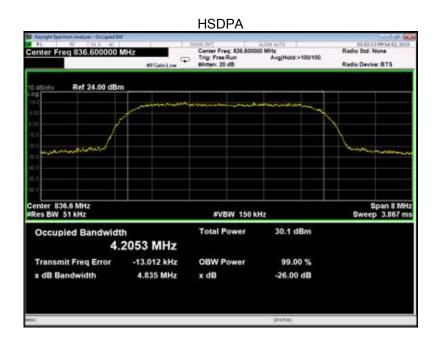
#### **GPRS**

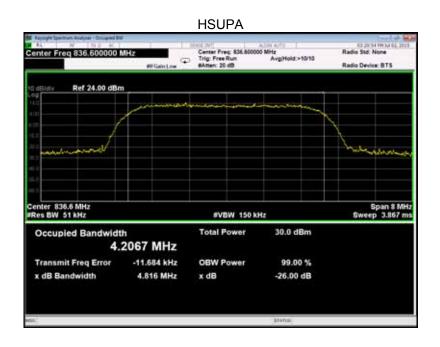




## WCDMA band V

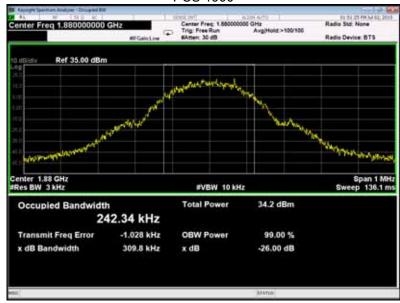




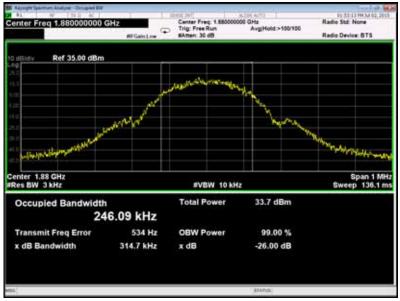


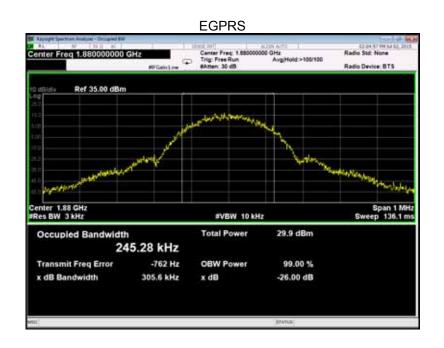
#### Cellular Band (Part 24E)

#### PCS 1900

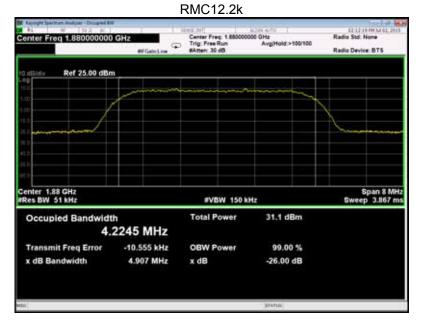


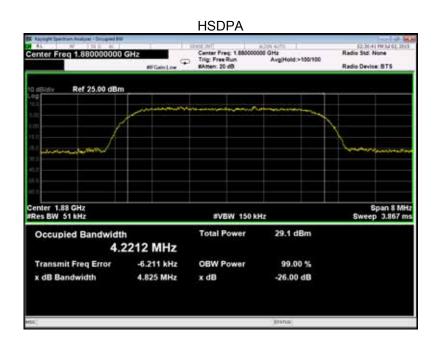
#### **GPRS**

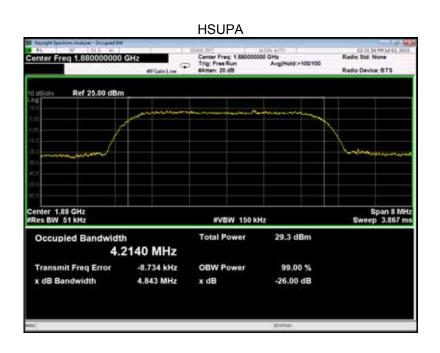




# WCDMA band II







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#### 9 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Requirement: FCC Part 2.1051,22.917(a),24.238(a)
Test Method: ANSI C63.4:2009, TIA/EIA-603-D:2010

Test Mode: Transmitting

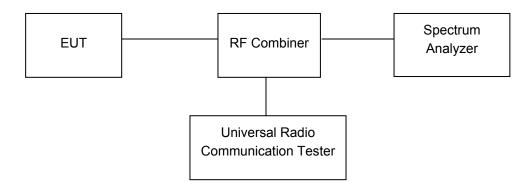
#### 9.1 EUT Operation

Operating Environment:

Temperature: 23.5 °C
Humidity: 52.1 % RH
Atmospheric Pressure: 101.3kPa

#### 9.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonics.



#### 9.3 **Test Result**

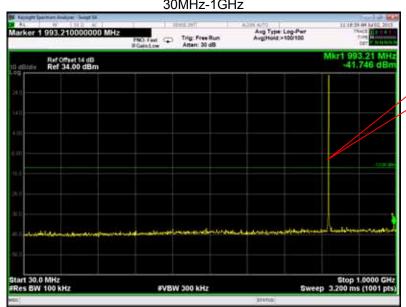
Remark: only the worst data were recorded.

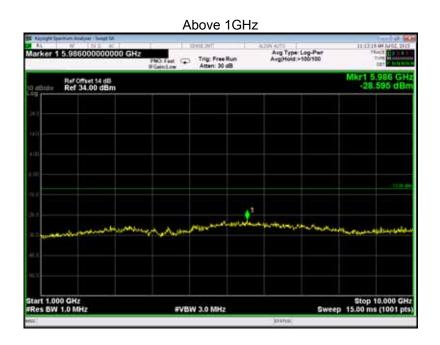
Cellular Band (Part 22H)

**GSM 850** 

30MHz-1GHz

Fundamental





## WCDMA band V

30MHz-1GHz

Fundamental

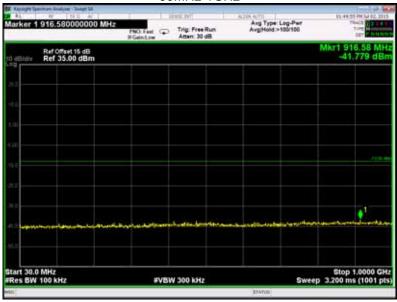


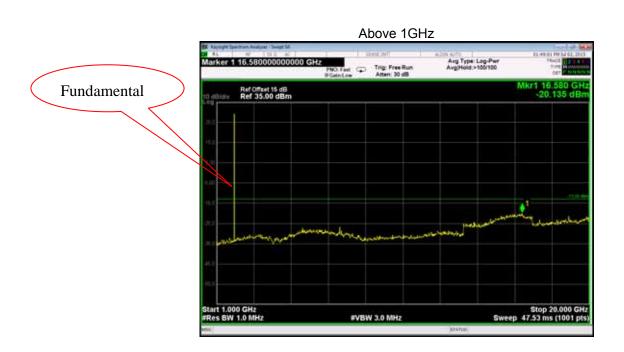
Above 1GHz



# Cellular Band (Part 24E) PCS 1900

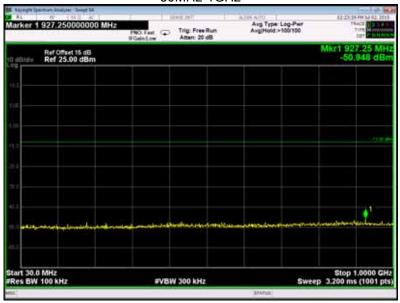
30MHz-1GHz





## WCDMA band II

#### 30MHz-1GHz



#### Above 1GHz

#### Fundamental



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#### 10 SPURIOUS RADIATED EMISSIONS

Test Requirement: FCC Part 2.1053,22.917,24.238.

Test Method: ANSI C63.4:2009, TIA/EIA-603-D:2010

Test Mode: Transmitting

#### **10.1 EUT Operation**

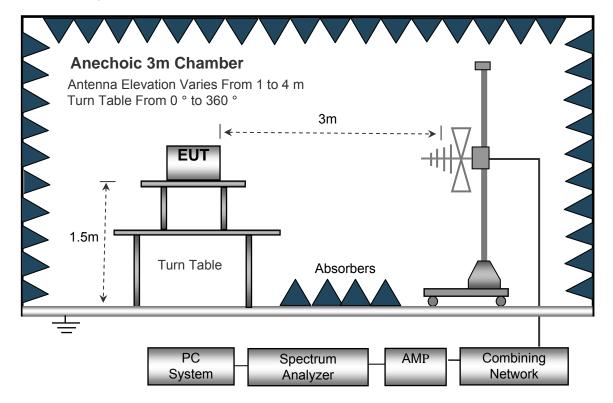
Operating Environment:

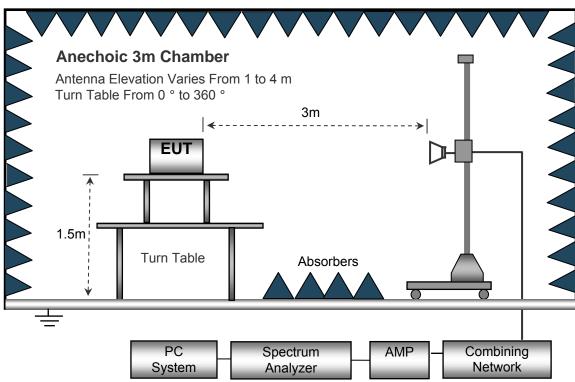
Temperature: 23.5 °C
Humidity: 52.1 % RH
Atmospheric Pressure: 101.2kPa

#### 10.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4.

The test setup for emission measurement from 30 MHz to 1 GHz.





The test setup for emission measurement above 1 GHz.

## 10.3 Spectrum Analyzer Setup

30MHz ~ 1GHz	<u>z</u>	
	Sweep Speed	. Auto
	Detector	.PK
	Resolution Bandwidth	.100kHz
	Video Bandwidth	.300kHz
Above 1GHz		
	Sweep Speed	. Auto
	Detector	.PK
	Resolution Bandwidth	.1MHz
	Video Bandwidth	.3MHz
	Detector	.Ave.
	Resolution Bandwidth	.1MHz
	Video Bandwidth	.10Hz

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#### 10.4 Test Procedure

- 1. The EUT is placed on a turntable, which is 1.5m above ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from 30MHz up to the tenth harmonic of the highest fundamental frequency.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
- 7. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.
  - Spurious emissions in dB =  $10 \lg (TXpwr in Watts/0.001) the absolute level Spurious attenuation limit in dB = <math>43 + 10 log 10$  (power out in Watts)
- 8. Repeat above procedures until the measurements for all frequencies are completed.

## 10.5 Summary of Test Results

Remark: Test performed from 30MHz to 10<sup>th</sup> harmonics with low/middle/high channels, only the worst data were recorded.

Cellular Band (Part 22H)

	Receiver	Turn	RX Ar	ntenna	Substituted		Absolute	Res	sult	
Frequency	Reading	table Angle	Height	Polar	SG Level	Cable	Antenna Gain	Level	Limit	Margin
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
				GSM 85	0 Channe	l 190				
211.35	42.57	333	1.4	Н	-67.94	0.15	0.00	-68.09	-13.00	-55.09
211.35	44.32	187	1.7	V	-63.27	0.15	0.00	-63.42	-13.00	-50.42
1673.20	65.33	352	2.1	Н	-48.64	0.30	9.40	-39.54	-13.00	-26.54
1673.20	55.21	167	1.6	V	-58.32	0.30	9.40	-49.22	-13.00	-36.22
2509.80	50.78	178	1.3	Н	-63.22	0.43	10.60	-53.05	-13.00	-40.05
2509.80	50.36	23	1.7	V	-59.92	0.43	10.60	-49.75	-13.00	-36.75
			WC	DMA Bar	nd V Char	nel 4132	2			
211.35	42.20	34	1.3	Н	-68.31	0.15	0.00	-68.46	-13.00	-55.46
211.35	44.61	243	2.0	V	-62.98	0.15	0.00	-63.13	-13.00	-50.13
1652.80	56.39	329	1.9	Н	-57.58	0.30	9.40	-48.48	-13.00	-35.48
1652.80	46.81	87	1.8	V	-66.72	0.30	9.40	-57.62	-13.00	-44.62
2479.20	42.54	296	2.1	Н	-71.46	0.43	10.60	-61.29	-13.00	-48.29
2479.20	42.28	301	1.8	V	-68.00	0.43	10.60	-57.83	-13.00	-44.83

Cellular Band (Part 24E)

		T	DV A		Dana (i		od		Do	
Frequency	Receiver	Turn table	RX AI	ntenna		Substitut	ea	Absolute	Res	sult
rrequericy	Reading	Angle	Height	Polar	SG Level	Cable	Antenna Gain	Level	Limit	Margin
(MHz)	(dBµV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
				PCS 190	0 Channe	el 512				
211.35	42.90	96	1.8	Н	-67.61	0.15	0.00	-67.76	-13.00	-54.76
211.35	42.28	41	2.1	V	-65.31	0.15	0.00	-65.46	-13.00	-52.46
3700.40	65.95	16	1.4	Н	-48.02	2.37	12.50	-37.89	-13.00	-24.89
3700.40	59.98	263	2.1	V	-53.55	2.37	12.50	-43.42	-13.00	-30.42
5550.60	53.58	178	1.3	Н	-60.42	2.86	12.90	-50.38	-13.00	-37.38
5550.60	44.73	40	1.3	V	-65.55	2.86	12.90	-55.51	-13.00	-42.51
			WC	DMA Bar	nd II Char	nel 9262	2			
211.35	42.38	18	1.1	Н	-68.13	0.15	0.00	-68.28	-13.00	-55.28
211.35	42.04	324	1.3	V	-65.55	0.15	0.00	-65.70	-13.00	-52.70
3704.80	58.12	22	1.6	Н	-55.85	2.37	12.50	-45.72	-13.00	-32.72
3704.80	52.32	265	1.1	V	-61.21	2.37	12.50	-51.08	-13.00	-38.08
5557.20	46.14	301	1.3	Н	-67.86	2.86	12.90	-57.82	-13.00	-44.82
5557.20	37.29	39	2.0	V	-72.99	2.86	12.90	-62.95	-13.00	-49.95

Note: 1) Absolute Level = SG Level - Cable loss + Antenna Gain

2) Margin = Limit- Absolute Level

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#### 11 Band Edge Measurement

Test Requirement: FCC Part 2.1051,22.917(a),24.238(a)
Test Method: ANSI C63.4:2009, TIA/EIA-603-D:2010

Test Mode: Transmitting

#### 11.1 EUT Operation

Operating Environment:

Temperature: 23.5 °C
Humidity: 52.3 % RH
Atmospheric Pressure: 101.3kPa

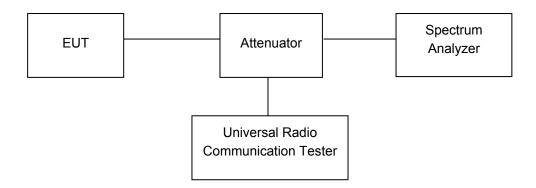
#### 11.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

According to FCC Part 22.917(a), the power of any emissions 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.

According to FCC Part 24.238(a), the power of any emissions 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.

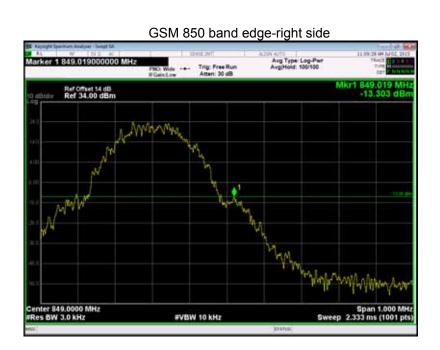
The center of the spectrum analyzer was set to block edge frequency

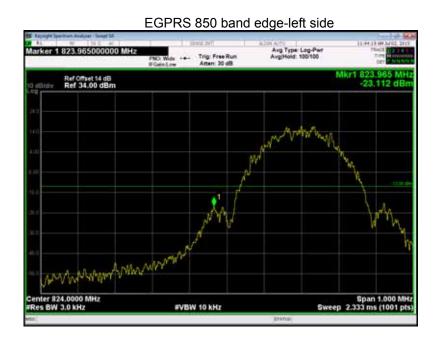


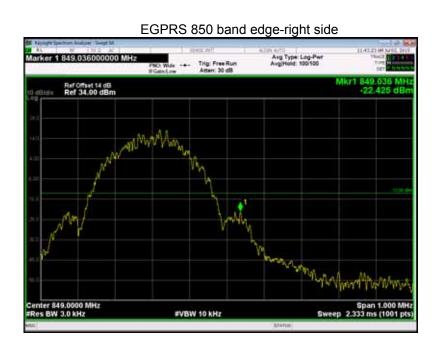
#### 11.3 Test Result

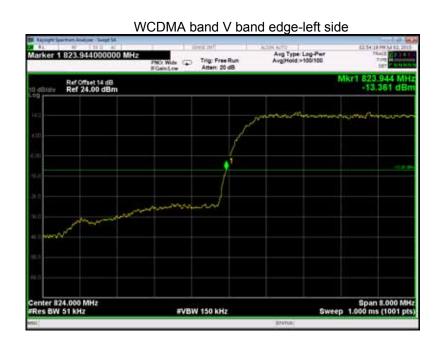
Test plots
Cellular Band (Part 22H)









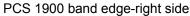




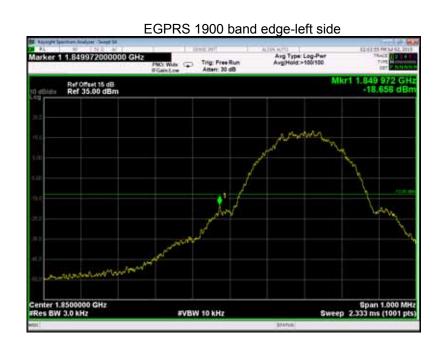
#### Cellular Band (Part 24E)

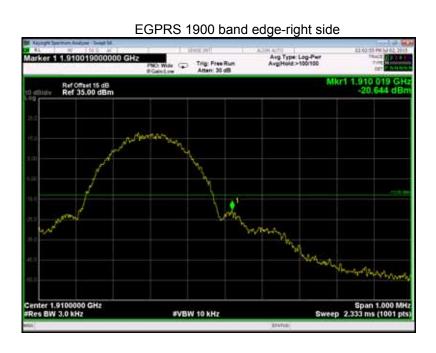
PCS 1900 band edge-left side

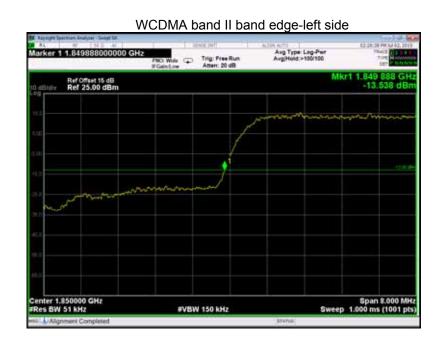














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#### 12 FREQUENCY STABILITY

Test Requirement: FCC Part 2.1055,22.355,24.235

Test Method: ANSI C63.4:2009, TIA/EIA-603-D:2010

Test Mode: Transmitting

#### 12.1 EUT Operation

Operating Environment:

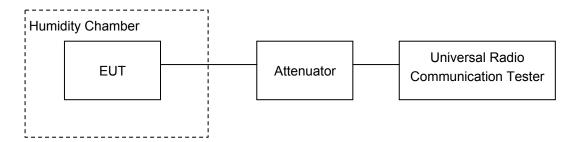
Temperature: 22.9 °C
Humidity: 52.0 % RH
Atmospheric Pressure: 101.3kPa

#### 12.2 Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



#### 12.3 Test Result

Cellular Band (Part 22H)

GSM 850 Test Frequency:836.6MHz									
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)					
50		3	0.0036	2.5					
40		-7	-0.0084	2.5					
30		8	0.0096	2.5					
20	3.7	2	0.0024	2.5					
10		1	0.0012	2.5					
0		10	0.0120	2.5					
-10		-7	-0.0084	2.5					
-20		-3	-0.0036	2.5					
-30		9	0.0108	2.5					
20	3.3	7	0.0084	2.5					
20	4.2	-5	-0.0060	2.5					

GPRS 850 Test Frequency:836.6MHz									
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)					
50		3	0.0036	2.5					
40		3	0.0036	2.5					
30		4	0.0048	2.5					
20		-1	-0.0012	2.5					
10	3.7	0	0.0000	2.5					
0		0	0.0000	2.5					
-10		-3	-0.0036	2.5					
-20		6	0.0072	2.5					
-30		-2	-0.0024	2.5					
20	3.3	8	0.0096	2.5					
20	4.2	-7	-0.0084	2.5					

EGPRS 850 Test Frequency:836.6MHz									
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)					
50		9	0.0108	2.5					
40		8	0.0096	2.5					
30		8	0.0096	2.5					
20		5	0.0060	2.5					
10	3.7	5	0.0060	2.5					
0		13	0.0155	2.5					
-10		3	0.0036	2.5					
-20		-3	-0.0036	2.5					
-30		-2	-0.0024	2.5					
20	3.3	8	0.0096	2.5					
20	4.2	9	0.0108	2.5					

	WCDMA Band V Test Frequency:836.6MHz									
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)						
50		0	0.0000	2.5						
40		2	0.0024	2.5						
30		-7	-0.0084	2.5						
20		1	0.0012	2.5						
10	3.7	9	0.0108	2.5						
0		7	0.0084	2.5						
-10		4	0.0048	2.5						
-20		1	0.0012	2.5						
-30		8	0.0096	2.5						
20	3.3	-2	-0.0024	2.5						
20	4.2	2	0.0024	2.5						

PCS Band (Part 24E)

POS Ballu (Falt 24E)										
	PCS 1900 Test Frequency:1880.0MHz									
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)						
50		3	0.0016	2.5						
40		12	0.0064	2.5						
30		7	0.0037	2.5						
20	3.7	7	0.0037	2.5						
10		4	0.0021	2.5						
0		15	0.0080	2.5						
-10		2	0.0011	2.5						
-20		11	0.0059	2.5						
-30		4	0.0021	2.5						
20	3.3	-1	-0.0005	2.5						
20	4.2	2	0.0011	2.5						

GPRS 1900 Test Frequency:1880.0MHz							
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)			
50		3	0.0016	2.5			
40		10	0.0053	2.5			
30	3.7	9	0.0048	2.5			
20		2	0.0011	2.5			
10		10	0.0053	2.5			
0		4	0.0021	2.5			
-10		3	0.0016	2.5			
-20		9	0.0048	2.5			
-30		-1	-0.0005	2.5			
20	3.3	-3	-0.0016	2.5			
20	4.2	2	0.0011	2.5			

EGPRS 1900 Test Frequency:1880.0MHz							
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)			
50		8	0.0043	2.5			
40		8	0.0043	2.5			
30	3.7	11	0.0059	2.5			
20		5	0.0027	2.5			
10		14	0.0074	2.5			
0		11	0.0059	2.5			
-10		-1	-0.0005	2.5			
-20		13	0.0069	2.5			
-30		0	0.0000	2.5			
20	3.3	8	0.0043	2.5			
20	4.2	-2	-0.0011	2.5			

WCDMA Band II Test Frequency:1880.0MHz							
Temperature ( )	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)			
50		10	0.0053	2.5			
40		1	0.0005	2.5			
30	3.7	11	0.0059	2.5			
20		2	0.0011	2.5			
10		6	0.0032	2.5			
0		9	0.0048	2.5			
-10		5	0.0027	2.5			
-20		1	0.0005	2.5			
-30		-7	-0.0037	2.5			
20	3.3	-1	-0.0005	2.5			
20	4.2	-3	-0.0016	2.5			

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## 13 RF Exposure

Remark: refer to SAR test report: WTS15S0628456E

===== End of Report =====