



# FCC RF Test Report

**APPLICANT** : Doro AB  
**EQUIPMENT** : GSM/WCDMA Mobile Telephone  
**BRAND NAME** : doro  
**MODEL NAME** : Doro PhoneEasy 622  
**MARKETING NAME** : Doro PhoneEasy 622  
**FCC ID** : WS5DORO622  
**STANDARD** : FCC 47 CFR Part 2, 24(E)  
**CLASSIFICATION** : PCS Licensed Transmitter Held to Ear (PCE)

The product was testing completed on Apr. 07, 2014. We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI / TIA / EIA-603-C-2004 and shown to be compliant with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



Testing Laboratory

2353

***SPORTON INTERNATIONAL (SHENZHEN) INC.***

*No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C.*



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### APPENDIX A. PHOTOGRAPHS OF EUT

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# REVISION HISTORY



## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	N/A	PASS	-
3.2	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.3	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.4	§2.1049 §24.238(b)	Occupied Bandwidth	N/A	PASS	-
3.5	§2.1051 §24.238(a)	Band Edge Measurement	$< 43+10\log_{10}(P[\text{Watts}])$	PASS	-
3.6	§2.1051 §24.238(a)	Conducted Spurious Emission	$< 43+10\log_{10}(P[\text{Watts}])$	PASS	-
3.7	§2.1053 §24.238(a)	Field Strength of Spurious Radiation	$< 43+10\log_{10}(P[\text{Watts}])$	PASS	Under limit 33.01 dB at 7520.000 MHz
3.8	§2.1055 §24.235	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS	-



## 1 General Description

### 1.1 Applicant

Doro AB

Magistratsvägen 10 SE-226 43 Lund Sweden

### 1.2 Manufacturer

CK TELECOM LTD.

Technology Road. High-Tech Development Zone. Heyuan, Guangdong, P.R.China.

### 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	GSM/WCDMA Mobile Telephone
Brand Name	doro
Model Name	Doro PhoneEasy 622
Marketing Name	Doro PhoneEasy 622
FCC ID	WS5DORO622
EUT supports Radios application	GSM/GPRS/WCDMA/Bluetooth v2.1 + EDR
HW Version	SHUTTLE-V2.0
SW Version	SHUTTLE-S01A_DORO622_L17EN_214_131010
EUT Stage	Production Unit

**Remark:** 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 subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	GSM1900: 1850.2 MHz ~ 1909.8MHz
Rx Frequency	GSM1900: 1930.2 MHz ~ 1989.8 MHz
Maximum Output Power to Antenna	GSM1900 : 30.23 dBm
99% Occupied Bandwidth	GSM1900: 248.00 kHz
Antenna Type	Fixed Internal Antenna
Type of Modulation	GSM: GMSK GPRS: GMSK



## 1.5 Modification of EUT

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

## 1.6 Maximum EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	Maximum EIRP (W)	Frequency Tolerance (ppm)	Emission Designator
Part 24	GSM1900 GSM	GMSK	1.13	0.02 ppm	248KGXW

## 1.7 Testing Location

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.			
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755- 3320-2398			
Test Site No.	Sportun Site No.		FCC Registration No.	
	TH01-SZ	03CH01-SZ	831040	

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.		
Test Site Location	No. 101, Complex Building C, Guanlong Village, Xili Town, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL:+86-755-8637-9589 FAX: +86-755-8637-9595		
Test Site No.	Sportun Site No.		
	OTA01-SZ		



## **1.8 Applicable Standards**

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

- FCC 47 CFR Part 2, 24(E)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01

**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

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different four orthogonal test planes (X, Y, Z, and cradle) to find the maximum emission (Y plane as worst plane).

Radiated emissions were investigated from 30 MHz to 19000 MHz.

Test Modes		
Band	Radiated TCs	Conducted TCs
GSM 1900	■ GSM Link	■ GSM Link

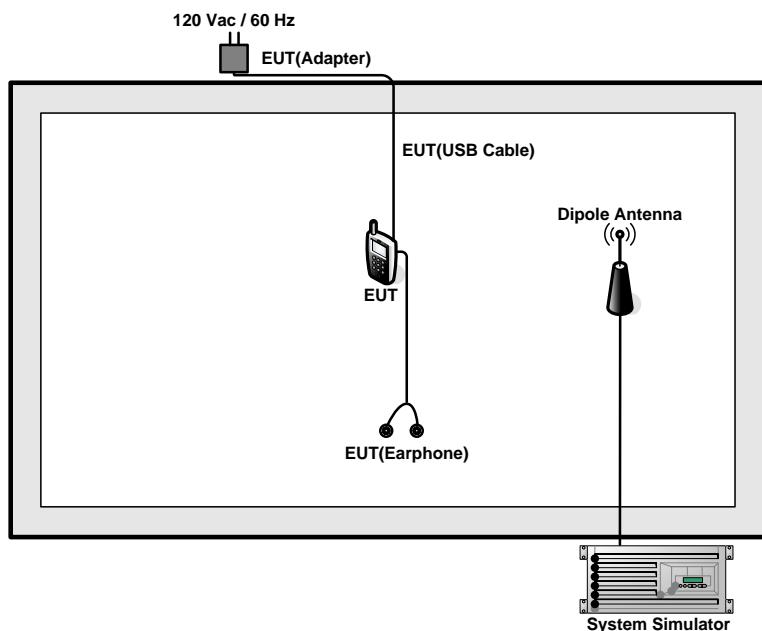
**Note:**

The maximum power levels are chosen to test as the worst case configuration as follows:  
GSM mode for GMSK modulation

#### Conducted Power Measurement Results:

Conducted Power (*Unit: dBm)			
Band	GSM1900		
Channel	512	661	810
Frequency	1850.2	1880.0	1909.8
GSM	30.14	30.16	30.23
GPRS class 8	30.11	30.14	30.20
GPRS class 10	29.24	29.30	29.40
GPRS class 11	27.26	27.40	27.49
GPRS class 12	26.20	26.37	26.44

## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	TOPWORD	3303DR	N/A	N/A	N/A



## 2.4 Measurement Results Explanation Example

### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

The following shows an offset computation example with RF cable loss 7.5 dB and a 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 7.5 + 10 = 17.5 \text{ (dB)} \end{aligned}$$

### 3 Test Result

#### 3.1 Conducted Output Power Measurement

##### 3.1.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

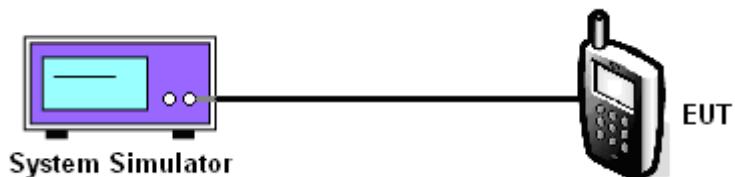
##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM.

##### 3.1.4 Test Setup





### 3.1.5 Test Result of Conducted Output Power

PCS Band			
Modes	GSM1900 (GSM)		
Channel	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8
Conducted Power (dBm)	30.14	30.16	30.23
Conducted Power (Watts)	1.03	1.04	1.05

**Note:** Maximum burst average power for GSM.

## 3.2 Peak-to-Average Ratio

### 3.2.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

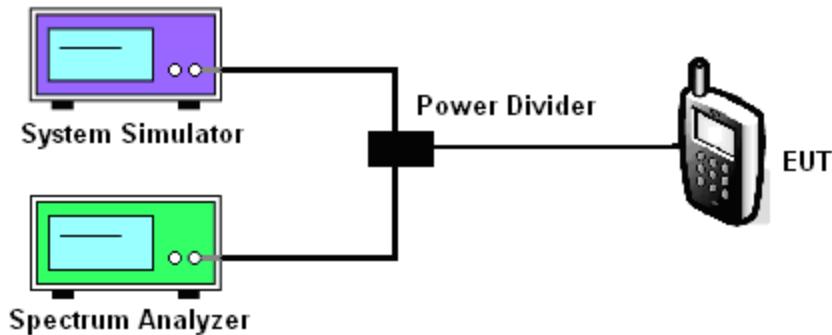
### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.2.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. For GSM/GPRS operating modes:
  - a. Set EUT in maximum power output.
  - b. Set the RBW = 1MHz, VBW = 3MHz, Peak detector on spectrum analyzer for first trace.
  - c. Set the RBW = 1MHz, VBW = 3MHz, RMS detector on spectrum analyzer for second trace.
  - d. The wanted burst signal is triggered by spectrum analyzer, and measured respectively the peak level and Mean level without burst-off time, after system simulator has synchronized with the spectrum analyzer.
3. Record the deviation as Peak to Average Ratio.

### 3.2.4 Test Setup



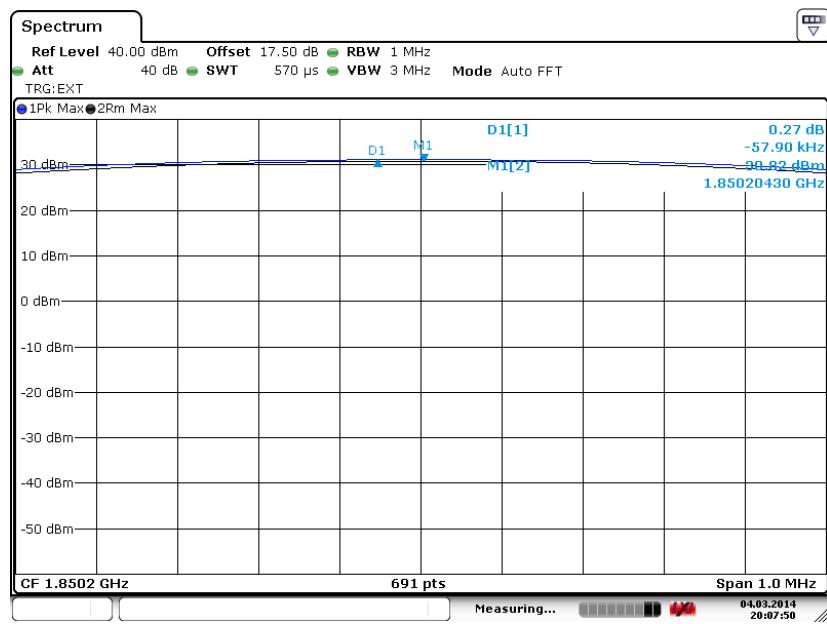
**3.2.5 Test Result of Peak-to-Average Ratio**

PCS Band			
Modes	GSM1900 (GSM)		
Channel	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8
Peak-to-Average Ratio (dB)	0.27	0.27	0.27

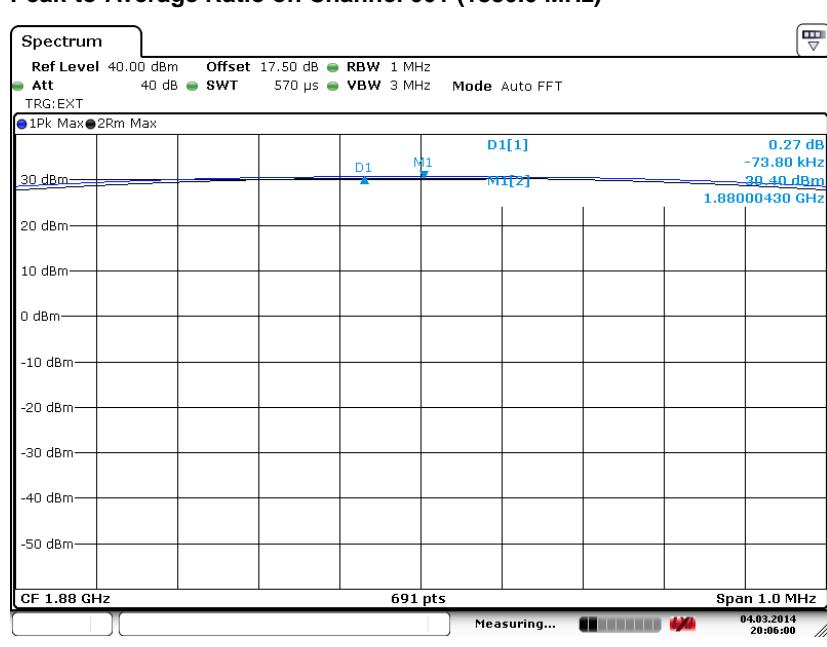
### 3.2.6 Test Result (Plots) of Peak-to-Average Ratio

<b>Band :</b>	GSM 1900	<b>Test Mode :</b>	GSM Link (GMSK)
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#### Peak-to-Average Ratio on Channel 512 (1850.2 MHz)

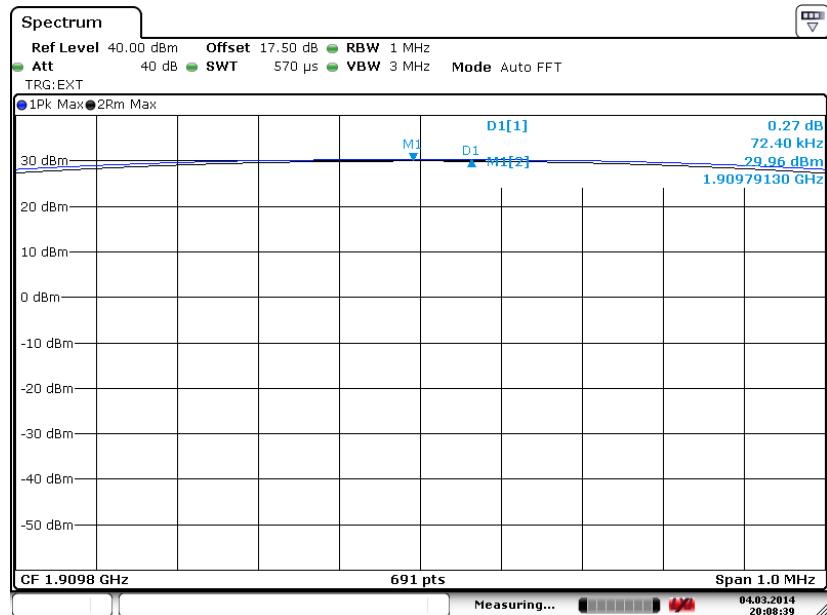


#### Peak-to-Average Ratio on Channel 661 (1880.0 MHz)





## Peak-to-Average Ratio on Channel 810 (1909.8 MHz)



Date: 4.MAR.2014 20:08:40



### 3.3 Effective Isotropic Radiated Power Measurement

#### 3.3.1 Description of the EIRP Measurement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. The EIRP of mobile transmitters are limited to 2 Watts.

#### 3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.3.3 Test Procedures

1. The EUT was placed on a turntable 1.5 meters high in a fully anechoic chamber.
2. The EUT was placed 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst; RMS detector over frame, and use channel power option with bandwidth=5MHz, per KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum EIRP.
6. Taking the record of maximum EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum EIRP of the substitution antenna.
10.  $EIRP = Ps + Et - Es + Gs = Ps + Rt - Rs + Gs$

Ps (dBm) : Input power to substitution antenna.

Gs (dBi or dBd) : Substitution antenna Gain.

$Et = Rt + AF$

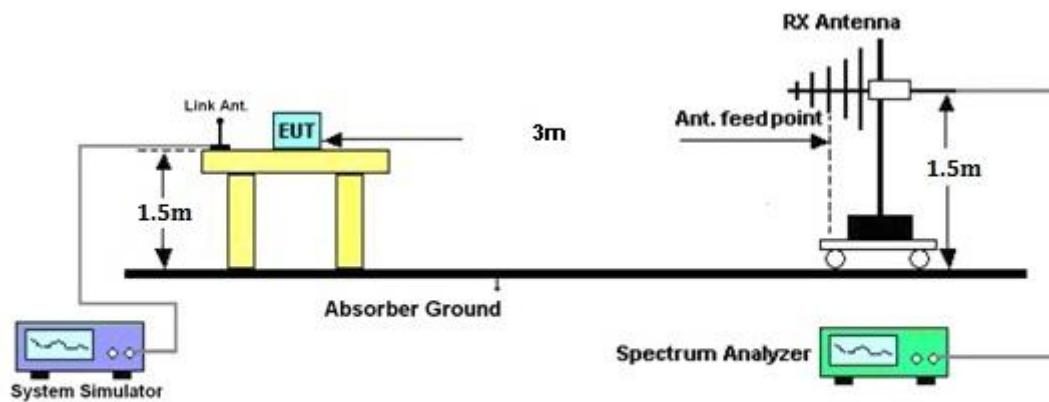
$Es = Rs + AF$

AF (dB/m) : Receive antenna factor

Rt : The highest received signal in spectrum analyzer for EUT.

Rs : The highest received signal in spectrum analyzer for substitution antenna.

### 3.3.4 Test Setup





## 3.3.6 Test Result of EIRP

GSM1900 (GSM) Radiated Power EIRP						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-23.59	-51.88	0.00	1.96	30.25	1.06
1880.00	-25.08	-52.99	0.00	2.00	29.91	0.98
1909.80	-26.39	-54.28	0.00	1.98	29.87	0.97

Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-23.54	-52.13	0.00	1.96	30.55	1.13
1880.00	-24.98	-53.17	0.00	2.00	30.19	1.05
1909.80	-26.06	-54.13	0.00	1.98	30.05	1.01

### 3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement

#### 3.4.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

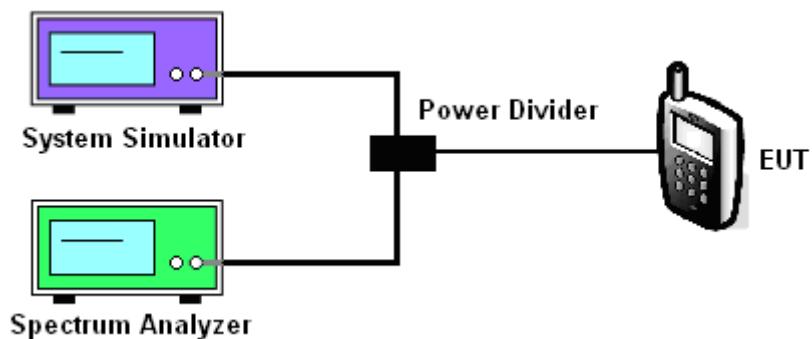
#### 3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.4.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3\*RBW, sample detector, trace maximum hold.
4. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3\*RBW, peak detector, trace maximum hold.

#### 3.4.4 Test Setup





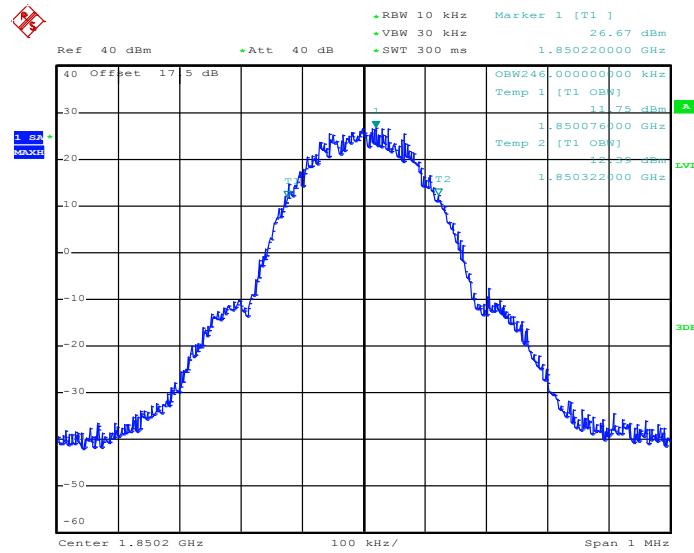
### 3.4.5 Test Result of 99% Occupied Bandwidth and 26dB Bandwidth

PCS Band			
Modes	GSM1900 (GSM)		
Channel	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8
99% OBW (kHz)	246.00	248.00	246.00
26dB BW (kHz)	310.00	306.00	312.00

### 3.4.6 Test Result (Plots) of Occupied Bandwidth and 26dB Bandwidth

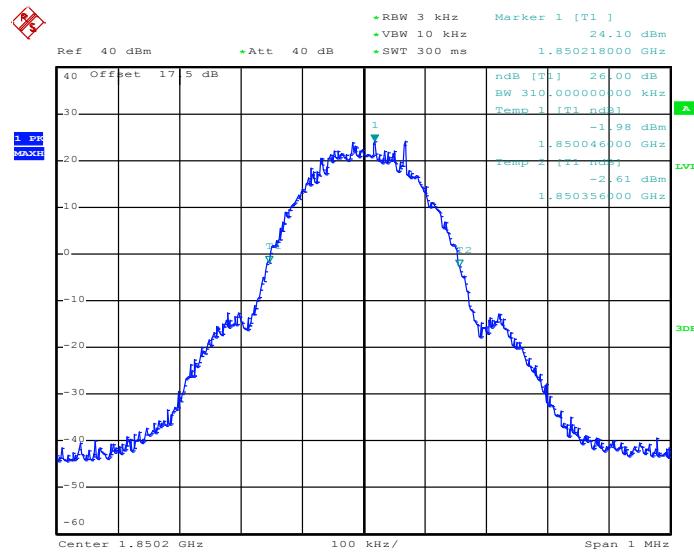
<b>Band :</b>	GSM 1900	<b>Test Mode :</b>	GSM Link (GMSK)
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**99% Occupied Bandwidth Plot on Channel 512 (1850.2 MHz)**

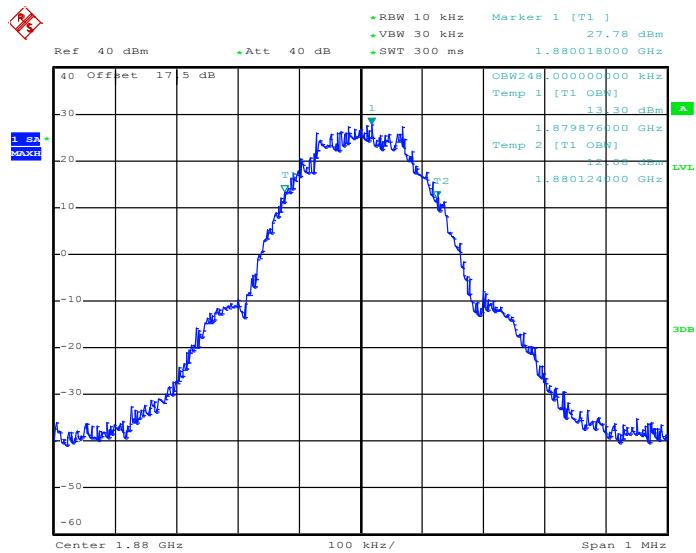


Date: 1.APR.2014 23:25:22

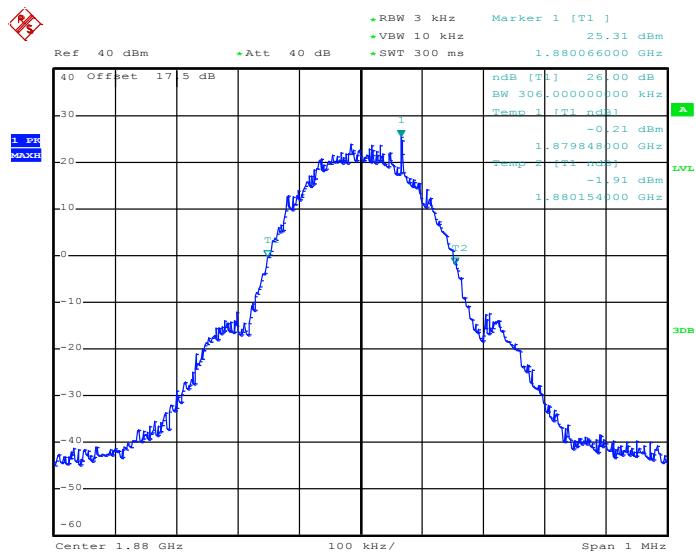
**26dB Bandwidth Plot on Channel 512 (1850.2 MHz)**



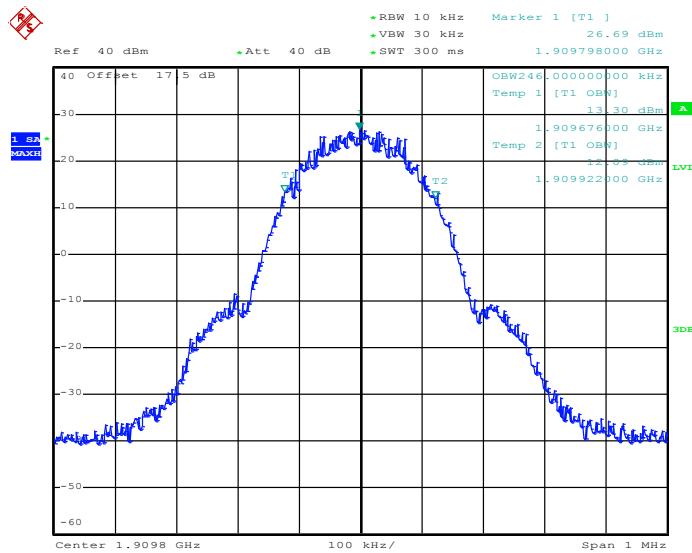
Date: 1.APR.2014 23:35:37

**99% Occupied Bandwidth Plot on Channel 661 (1880.0 MHz)**


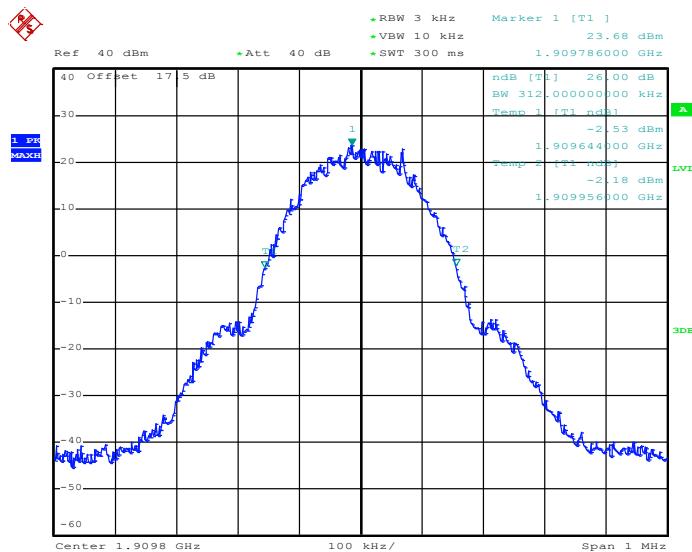
Date: 1.APR.2014 23:23:41

**26dB Bandwidth Plot on Channel 661 (1880.0 MHz)**


Date: 1.APR.2014 23:33:39

**99% Occupied Bandwidth Plot on Channel 810 (1909.8 MHz)**


Date: 1.APR.2014 23:27:34

**26dB Bandwidth Plot on Channel 810 (1909.8 MHz)**


Date: 1.APR.2014 23:30:48

## 3.5 Band Edge Measurement

### 3.5.1 Description of Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

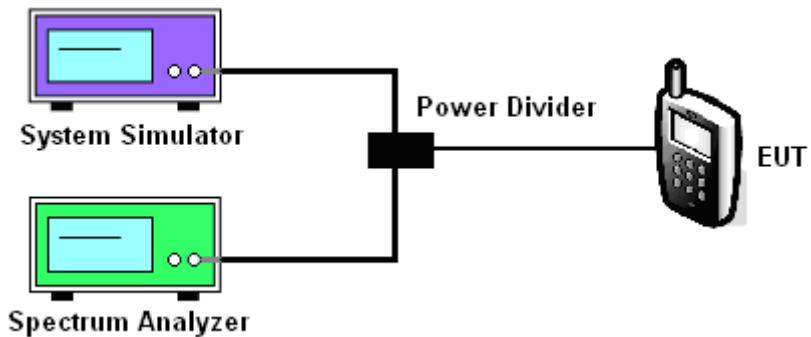
### 3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.5.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The band edges of low and high channels for the highest RF powers were measured.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)]$  (dB)  
 $= [30 + 10\log(P)]$  (dBm) -  $[43 + 10\log(P)]$  (dB)  
 $= -13$  dBm.

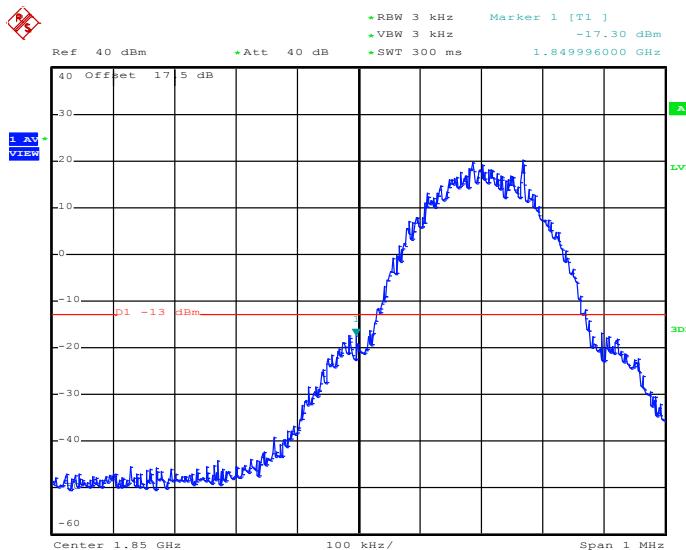
### 3.5.4 Test Setup



### 3.5.5 Test Result (Plots) of Conducted Band Edge

Band :	GSM1900	Test Mode :	GSM Link (GMSK)
Correction Factor :	0.17dB	Maximum 26dB Bandwidth :	0.312MHz
Band Edge :	-17.13dBm	Measurement Value :	-17.30dBm

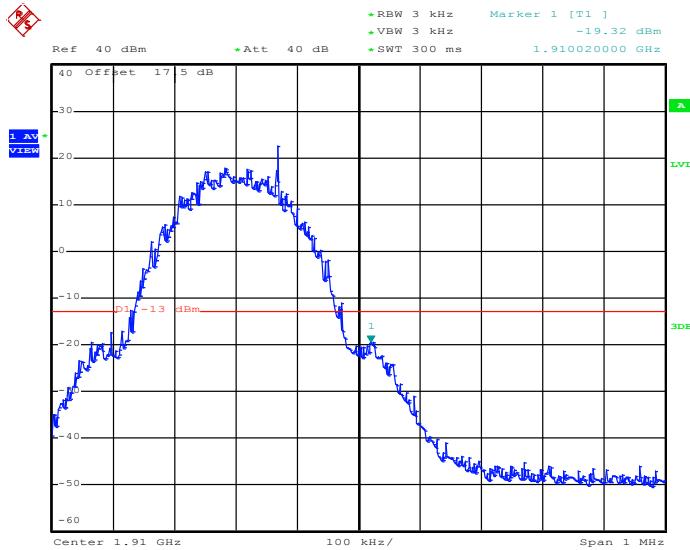
Lower Band Edge Plot on Channel 512 (1850.2 MHz)



Date: 1.APR.2014 23:39:16

1. Correction Factor(dB)=  $10\log(1\% \text{ Emission BW}/\text{RBW})$
2. Band Edge= Measurement Value + Correction Factor(dB)

<b>Band :</b>	GSM1900	<b>Test Mode :</b>	GSM Link (GMSK)
<b>Correction Factor :</b>	0.17dB	<b>Maximum 26dB Bandwidth :</b>	0.312MHz
<b>Band Edge :</b>	-19.15dBm	<b>Measurement Value :</b>	-19.32dBm

**Higher Band Edge Plot on Channel 810 (1909.8 MHz)**


Date: 1.APR.2014 23:42:35

1. *Correction Factor(dB)= 10log(1% Emission BW/RBW)*
2. *Band Edge= Measurement Value + Correction Factor(dB)*

## 3.6 Conducted Spurious Emission Measurement

### 3.6.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

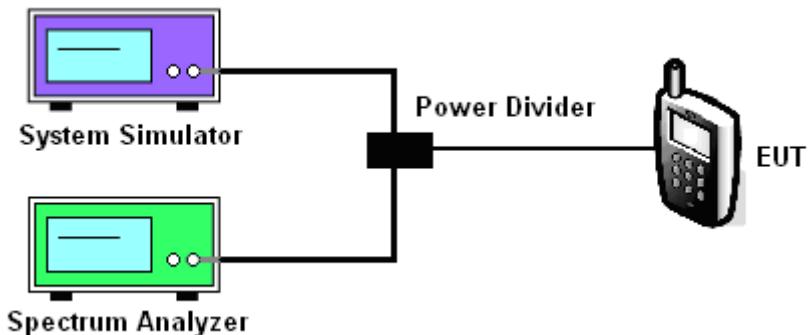
### 3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.6.3 Test Procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was measured.
4. The conducted spurious emission for the whole frequency range was taken.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)  
 $= P(W) - [43 + 10\log(P)]$  (dB)  
 $= [30 + 10\log(P)]$  (dBm) -  $[43 + 10\log(P)]$  (dB)  
 $= -13$  dBm.

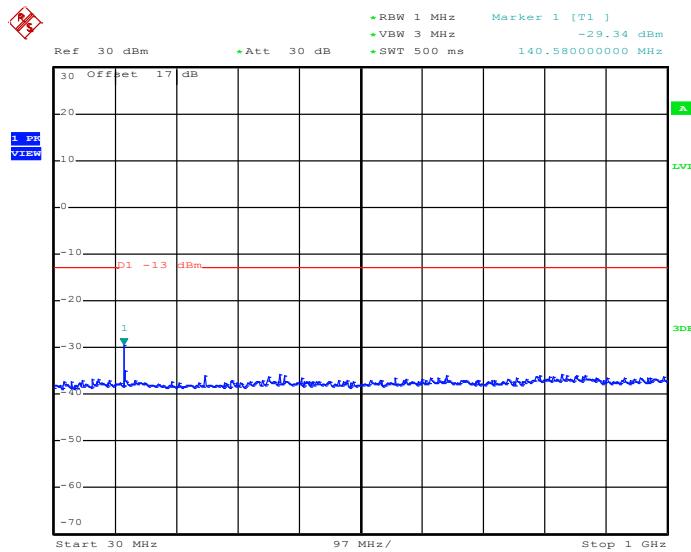
### 3.6.4 Test Setup



### 3.6.5 Test Result (Plots) of Conducted Spurious Emission

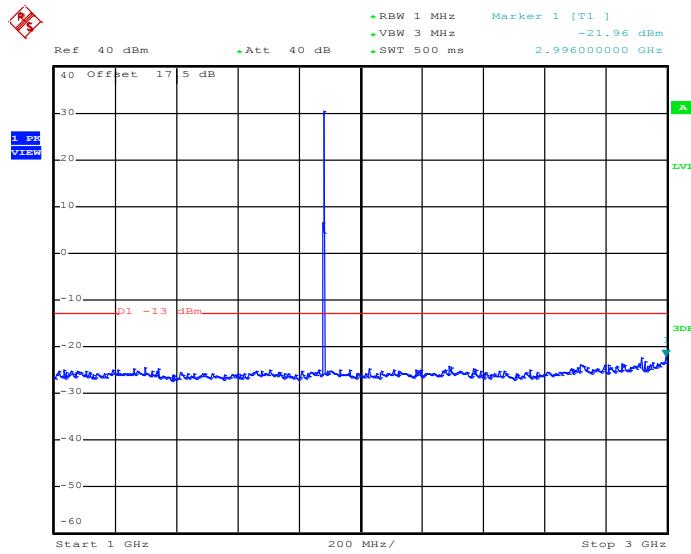
<b>Band :</b>	GSM1900	<b>Channel :</b>	CH661
<b>Test Mode :</b>	GSM Link (GMSK)	<b>Frequency :</b>	1880.0 MHz

**Conducted Spurious Emission Plot between 30MHz ~ 1GHz**



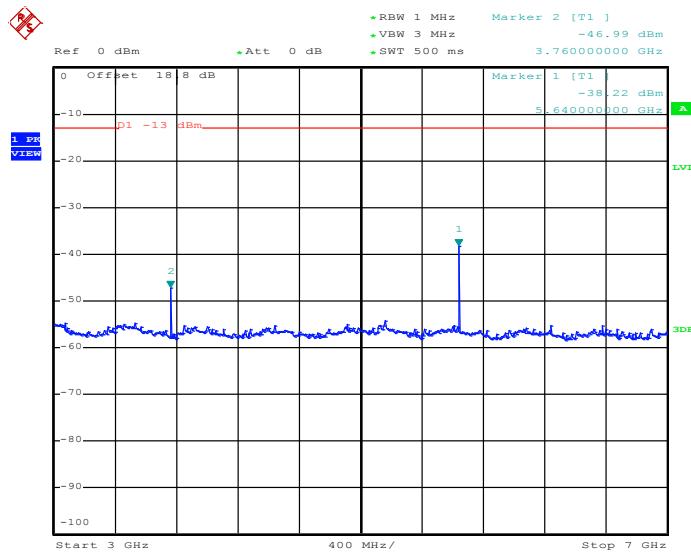
Date: 1.APR.2014 23:48:03

**Conducted Spurious Emission Plot between 1GHz ~ 3GHz**



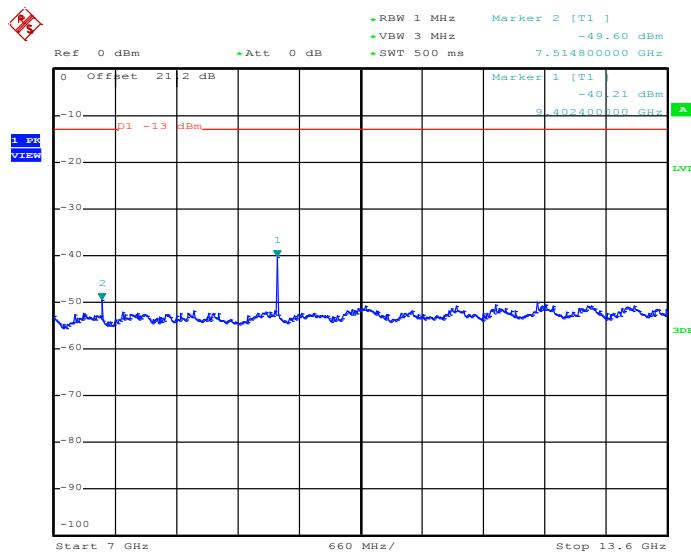
Date: 1.APR.2014 23:49:01

### Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 1.APR.2014 23:50:58

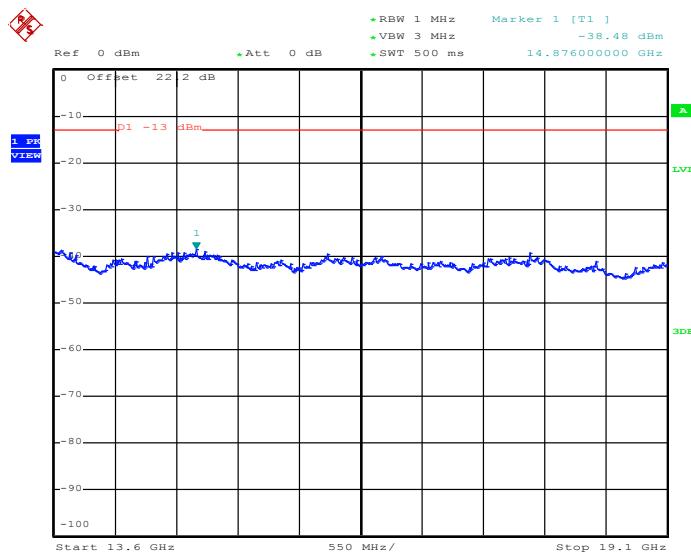
### Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



Date: 1.APR.2014 23:52:53



## Conducted Spurious Emission Plot between 13.6GHz ~ 19.1GHz



Date: 1.APR.2014 23:53:43



## 3.7 Field Strength of Spurious Radiation Measurement

### 3.7.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

### 3.7.2 Measuring Instruments

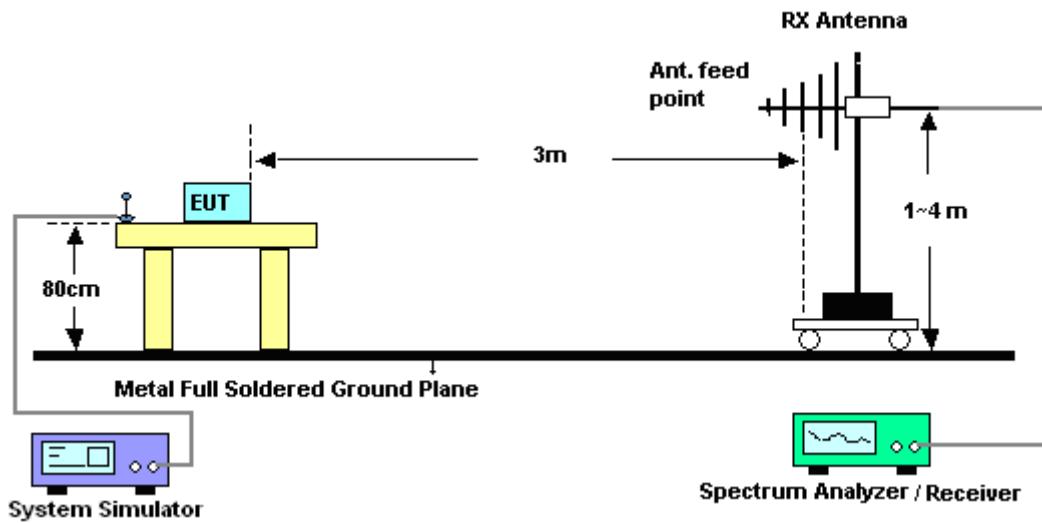
The measuring equipment is listed in the section 4 of this test report.

### 3.7.3 Test Procedures

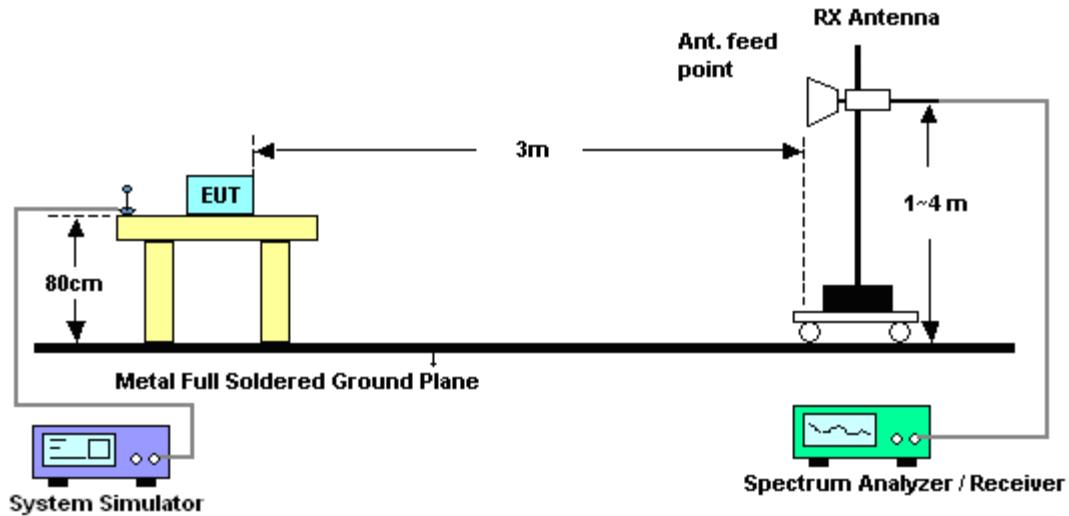
1. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
12. The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)  
$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$
$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$
$$= -13 \text{ dBm.}$$

### 3.7.4 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





## 3.7.5 Test Result of Field Strength of Spurious Radiated

Band :	GSM1900		Temperature :	23~25°C					
Test Mode :	GSM Link (GMSK)		Relative Humidity :	48~52%					
Test Engineer :	Kaer Huang		Polarization :	Horizontal					
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.								
<p>Level (dBm)</p> <p>Date: 2014-04-07</p> <p>-13dBm</p> <p>Frequency (MHz)</p>									
Site	: 03CH01-SZ								
Condition	: -13DBM HF_EIRP_H_130101 HORIZONTAL								
Frequency	EIRP	Limit	Over Limit	SPA	S.G.	TX Cable	TX Antenna	Polarization	Result
( MHz )	( dBm )	( dBm )	( dB )	Reading (dBm)	Power (dBm)	loss ( dB )	Gain (dBi)	( H/V )	
3760	-56.17	-13	-43.17	-68.32	-62.91	1.28	8.02	H	Pass
5640	-50.55	-13	-37.55	-68.54	-58.97	1.58	10.00	H	Pass
7520	-46.01	-13	-33.01	-67.95	-56.33	1.78	12.10	H	Pass



<b>Band :</b>	GSM1900		<b>Temperature :</b>	23~25°C					
<b>Test Mode :</b>	GSM Link (GMSK)		<b>Relative Humidity :</b>	48~52%					
<b>Test Engineer :</b>	Kaer Huang		<b>Polarization :</b>	Vertical					
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.								
 Date: 2014-04-07									
Site	: 03CH01-SZ								
Condition	: -13DBM HF_EIRP_V_130101 VERTICAL								
Frequency	EIRP	Limit	Over Limit	SPA	S.G.	TX Cable	TX Antenna	Polarization	Result
( MHz )	( dBm )	( dBm )	( dB )	Reading	Power	loss	Gain	( H/V )	
3760	-52.99	-13	-39.99	-68.02	-59.73	1.28	8.02	V	Pass
5640	-51.97	-13	-38.97	-69.05	-60.39	1.58	10	V	Pass
7520	-46.73	-13	-33.73	-68.98	-57.05	1.78	12.1	V	Pass



## 3.8 Frequency Stability Measurement

### 3.8.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

### 3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

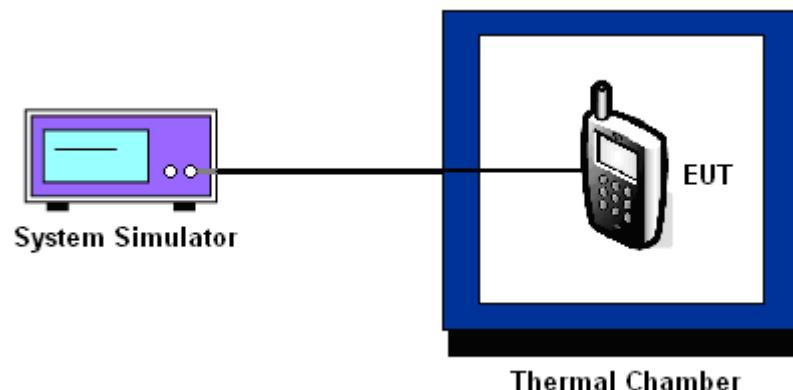
### 3.8.3 Test Procedures for Temperature Variation

1. The EUT was set up in the thermal chamber and connected with the system simulator.
2. With power OFF, the temperature was decreased to  $-30^\circ\text{C}$  and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3. With power OFF, the temperature was raised in  $10^\circ\text{C}$  steps up to  $50^\circ\text{C}$ . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

### 3.8.4 Test Procedures for Voltage Variation

1. The EUT was placed in a temperature chamber at  $25\pm 5^\circ\text{C}$  and connected with the system simulator.
2. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

### **3.8.5 Test Setup**





### 3.8.6 Test Result of Temperature Variation

<b>Band :</b>	GSM 1900		<b>Channel :</b>	661	
<b>Limit (ppm) :</b>	2.5		<b>Frequency :</b>	1880.0 MHz	
<b>Temperature (°C)</b>	<b>GSM</b>			<b>Result</b>	
	<b>Freq. Dev. (Hz)</b>		<b>Deviation (ppm)</b>		
	-30			PASS	
	34				
	-20				
	32				
	-10				
	31				
	0				
	28				
	10				
	30				
	20				
	32				
	30				
	34				
	40				
	35				
	50				
	37				
	+0.02				
	+0.02				
	+0.02				
	+0.01				
	+0.02				
	+0.02				
	+0.02				
	+0.02				
	+0.02				
	+0.02				



### 3.8.7 Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Freq. Dev. (Hz)	Deviation (ppm)	Limit (ppm)	Result
GSM 1900 CH661	GSM	3.7	32	+0.02	2.5	Pass
		BEP	30	+0.02		
		4.2	34	+0.02		

**Note:**

1. Normal Voltage = 3.7V.
2. Battery End Point (BEP) = 3.6 V.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP30	101400	9kHz~30GHz	Mar. 03, 2014	Mar. 04, 2014~Apr. 01, 2014	Mar. 02, 2015	Conducted (TH01-SZ)
Spectrum Analyzer	R&S	FSV30	101338	9kHz~30GHz; Max 30dBm	Jun. 17, 2013	Mar. 04, 2014~Apr. 01, 2014	Jun. 16, 2014	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	13dBm~~20dBm	Mar. 03, 2014	Mar. 04, 2014~Apr. 01, 2014	Mar. 02, 2015	Conducted (TH01-SZ)
Power Sensor	Anritsu	MA2411B	1207253	0.3GHz~40GHz	Mar. 03, 2014	Mar. 04, 2014~Apr. 01, 2014	Mar. 02, 2015	Conducted (TH01-SZ)
Thermal Chamber	Hongzhan	LP-150U	HD20120425	-40°C~150°C	Feb. 21, 2014	Mar. 04, 2014~Apr. 01, 2014	Feb. 20, 2015	Conducted (TH01-SZ)
Signal Analyzer	R&S	FSV40	101078	10Hz~40GHz	Jun. 17, 2013	Apr. 07, 2014	Jun. 16, 2014	Radiation (03CH01-SZ)
Bilog Antenna	SCHAFFNER	CBL6112B	2614	30MHz~2GHz	Dec. 23, 2013	Apr. 07, 2014	Dec. 22, 2014	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS Lindgren	3117	00119436	1GHz~18GHz	Oct. 26, 2013	Apr. 07, 2014	Oct. 25, 2014	Radiation (03CH01-SZ)
Amplifier	ADVANTEST	BB525C	E9007003	9kHz~3000MHz	Feb. 21, 2014	Apr. 07, 2014	Feb. 20, 2015	Radiation (03CH01-SZ)
Amplifier	Agilent	83017A	MY39501302	3Hz~26.5GHz	Mar. 03, 2014	Apr. 07, 2014	Mar. 02, 2015	Radiation (03CH01-SZ)
Turn Table	EM Electronics	EM 1000	N/A	0~360 degree	NCR	Apr. 07, 2014	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM Electronics	EM 1000	N/A	1 m~4 m	NCR	Apr. 07, 2014	NCR	Radiation (03CH01-SZ)
Spectrum Analyzer	R&S	FSP 7	100818	9kHz~7GHz	Sep. 03, 2013	Apr. 01, 2014	Sep. 02, 2014	EIRP (OTA01-SZ)
Quad-Ridged Horn	ETS-Lindgren	3164-08	00102954	700MHz~10000MHz	N/A	Apr. 01, 2014	N/A	EIRP (OTA01-SZ)
Multi-Devices Controller	ETS-Lindgren	2090-OPT1	00108147	N/A	N/A	Apr. 01, 2014	N/A	EIRP (OTA01-SZ)
Switch Control Mainframe	Agilent	3499A	MY42005451	N/A	N/A	Apr. 01, 2014	N/A	EIRP (OTA01-SZ)



## 5 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))</b>	<b>3.90</b>
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## **Appendix A. Photographs of EUT**

Please refer to Sporton report number EP431101 which is issued separately.