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# Report On

FCC Testing of the  
Shanghai SAND Information Technology System Co.,Ltd  
GSM/GPRS EFT-POS PS400  
In accordance with FCC CFR 47 Part 15 Part C

COMMERCIAL-IN-CONFIDENCE

FCC ID: XLHPS400

Document 57008081 Report 02 Issue 1

August 2009



Product Service

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**REPORT ON**

FCC CRF 47 Parts 15 C: 2008 Testing of the  
Shanghai SAND Information Technology System Co.,Ltd  
GSM/GPRS EFT-POS PS400

Document 57008081 Report 02 Issue 1

August 09

**PREPARED FOR**

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**APPROVED BY**

  
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**DATED**

18 August 2009

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**ENGINEERING STATEMENT**

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s):

  
Q Li

  
X Zhang

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## **SECTION 1**

### **REPORT SUMMARY**

FCC Testing of the Shanghai SAND Information Technology System Co.,Ltd  
GSM/GPRS EFT-POS PS400  
in accordance with FCC CFR 47 Part 15C



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Shanghai SAND Information Technology System Co.,Ltd GSM/GPRS EFT-POS PS400 to the requirements of FCC CFR 47 Part 15C: 2008.

Testing was carried out in support of an application for Grant of Equipment Authorisation of GSM/GPRS EFT-POS PS400.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Shanghai SAND Information Technology System Co.,Ltd
Model Number(s)	GSM/GPRS EFT POS Machine PS400
Serial Number(s)	Engineering sample
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C: 2008
Incoming Release Date	Declaration of Build Status 08 January 2009
Start of Test	08 January 2009
Finish of Test	07 July 2009
Name of Engineer(s)	Q Li X Zhang
Related Document(s)	FCC CFR 47 Part 15:2008 ANSI C63.4:2003



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 15: 2008.

Configuration 1- GSM/GPRS EFT-POS						
Section	FCC Clause	Test Description	Mode	Mod State	Result	Comments
2.1	15.225(a)-(d)	Spectrum mask	13.56 MHz	0	Pass	-
2.2	15.225 (d) 15.205(b) 15.209	Radiated emission 9kHz-30MHz	13.56MHz	0	Pass	-
2.3	15.225 (d) 15.205(b) 15.209	Radiated emission 30MHz-1GHz	13.56MHz	0	Pass	-
2.4	15.215(c)	Bandwidth of the emission	13.56MHz	0	Pass	-
2.5	15.225(e)	Frequency Error	13.56 MHz	0	Pass	-



### 1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	GSM/GPRS EFT-POS
MANUFACTURER	Shanghai SAND Information Technology System Co.,Ltd
TYPE	PS400
PART NUMBER	--
SERIAL NUMBER	Engineering sample
HARDWARE VERSION	--
SOFTWARE VERSION	--
TRANSMITTER OPERATING RANGE	13.56MHz
RECEIVER OPERATING RANGE	13.56MHz
COUNTRY OF ORIGIN	P.R. CHINA
INTERMEDIATE FREQUENCIES	None
ITU DESIGNATION OF EMISSION	3K21A1D
HIGHEST INTERNALLY GENERATED FREQUENCY	13.56MHz
FCC ID	XLHPS400
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Dual Band GSM/GPRS EFT-POS with RFID Reader
MANUFACTURING DESCRIPTION	<p>The EFT-POS PS400 was powered by a Lithium Battery: 7.4Vdc normal; 6.8V – 8.4Vdc extreme</p> <p>The battery could be charged by the adaptor:            Model Type: HKA01210008-2A            Manufacturer: Hunkey            Input: 100 – 240Vac, 0.5 Amax, 50/60Hz            Output: 10.0Vdc, 0.8A</p>

Signature

Zeng Jing

Date

10 January 2009

D of B S Serial No

57008081

No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.



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## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) PS400 was a Shanghai SAND Information Technology System Co.,Ltd GSM/GPRS EFT-POS as shown below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



#### 1.4.2 Test Configuration

The EUT was configured in accordance with FCC CFR 47 Part 15: 2008.

The EUT was powered by a 7.4V full charged Battery.

Test Configuration 1 – 13.56MHz RFID

#### 1.4.3 Modes of Operation

##### Operation Modes

Mode 1 – 13.56 MHz (Modulation)

Mode 2 – 13.56 MHz (Carrier)

Information on the specific test modes utilised are detailed in the test procedure for each individual test.



## 1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

## 1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

## 1.7 MODIFICATION RECORD

Modification State	Description of Modification fitted to EUT	Sample S/N
0	Initial sample supplied by customer	Engineering sample

No modifications were made to the EUT during testing.

## 1.8 ALTERNATIVE TEST SITE

The testing was conducted at following site registrations:

FCC Accreditation

910917 The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.



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## **SECTION 2**

### **TEST DETAILS**

FCC Testing of the Shanghai SAND Information Technology System Co.,Ltd  
GSM/GPRS EFT-POS PS400  
in accordance with FCC CFR 47 Part 15C



## 2.1 SPECTRUM MASK

### 2.1.1 Specification Reference

FCC CFR 47 Part 15: 2008, Subpart C, Clause 15.225(a)-(d)

### 2.1.2 Equipment Under Test

GSM/GPRS EFT-POS PS400

### 2.1.3 Date of Test and Modification State

06 July 2009 – Modification State 0

### 2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15: 2008.

The EUT was put on a remotely controlled turntable in a semi-anechoic chamber. The maximum spectrum mask of the EUT was obtained using an active loop antenna connected to the spectrum analyzer via an RF cable with the EUT was rotated by 360 degrees. The path loss of the cable was measured and entered as an offset. The peak level was recorded with resolution bandwidth set to 1kHz for 13.553 to 13.567MHz and 10kHz for outside of this band.

The measurements were performed at a 3m distance with Peak detector, however, the regulation requires testing at 30 meters distance for frequency below 30MHz, the limit level for 3m measurement distance is calculated by using the square of an inverse linear distance extrapolation factor(40dB/decade) as following:

$$L_{dm} = L_d + (-40 \text{dB/decade}) * (\lg(dm) - \lg(d))$$

$L_{dm}$ : Limit at measurement distance

$L_d$ : Limit at specified distance

$d_m$ : Used measurement Distance

$d$ : Specified measurement distance

The test was performed with the EUT in the following configurations and modes of operation:

Configuration1 - Mode 1

### 2.1.6 Environmental Conditions

06 July 2009

Ambient Temperature 23.2°C

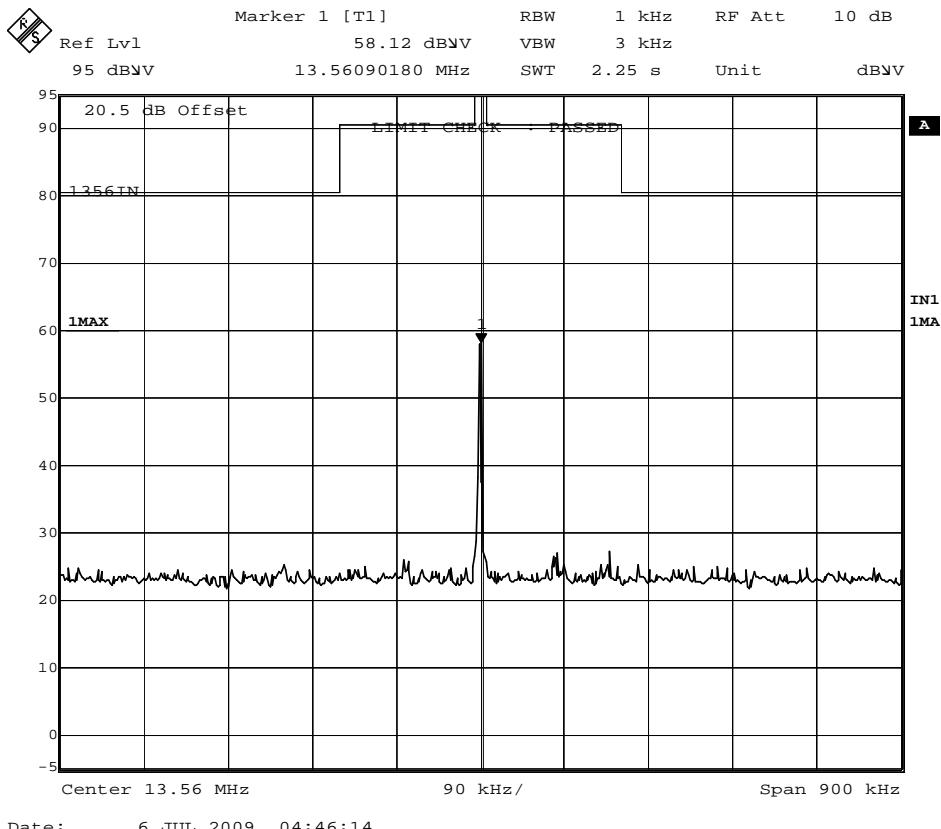
Relative Humidity 24.1%



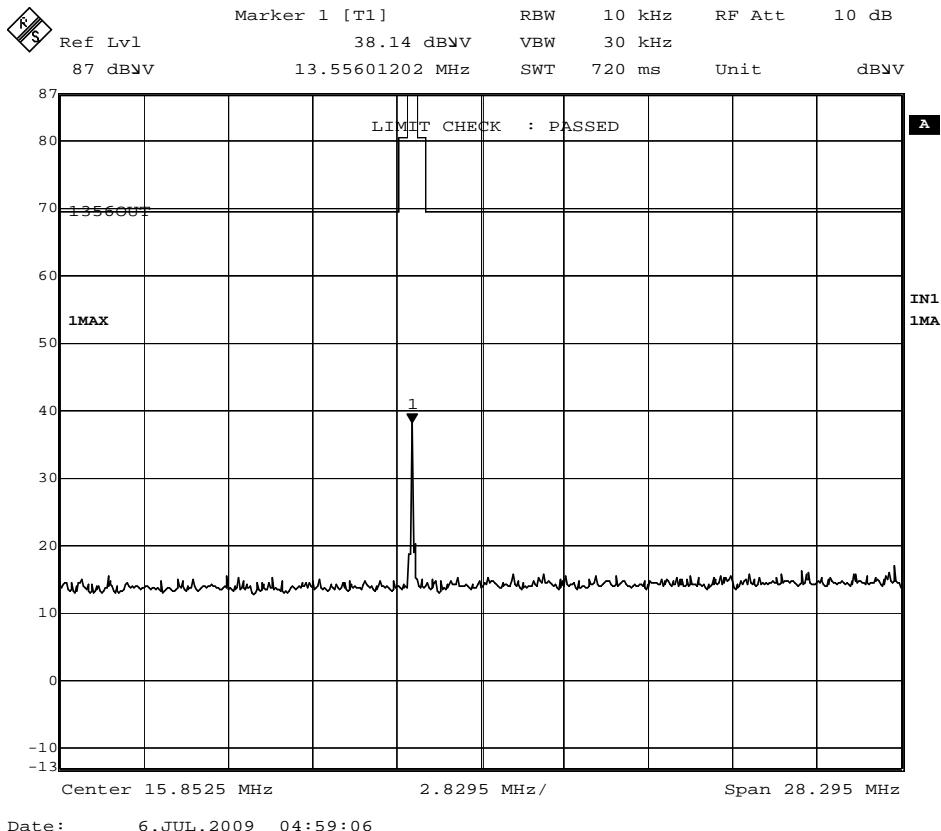
### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15: 2008 for the field strength within the band 13.110-14.010MHz and outside of this band.

The plots of test results are shown below:



Plot1: Result of Spectrum Mask Measurement in band 13.110-14.010MHz



Plot2: Result of Emission Measurement in frequency range 1.705-30MHz

Limit level:

Frequency range (MHz)	Field Strength ( $\mu$ V/m)	Field Strength (dB $\mu$ V/m)	Measurement distance (meters)
1.705-13.110	30	29.5	30
13.110-13.410	106	40.5	30
13.410-13.553	334	50.5	30
13.553-13.567	15848	84.0	30
13.567-13.710	334	50.5	30
13.710-14.010	106	40.5	30
14.010-30	30	29.5	30

Remarks

The EUT does not exceed the limit level at the measured frequencies.



## 2.2 RADIATED EMISSION 9KHZ-30MHZ

### 2.2.1 Specification Reference

FCC CFR 47 Part 15: 2008, Subpart C, Clause 15.225(d), 15.205(b), 15.209

### 2.2.2 Equipment Under Test

GSM/GPRS EFT-POS PS400

### 2.2.3 Date of Test and Modification State

06 July 2009 – Modification State 0

### 2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15: 2008.

The EUT was put on a remotely controlled turntable in a semi-anechoic chamber. The emissions of the EUT were obtained using an active loop antenna connected to the spectrum analyzer via an RF cable with the EUT was rotated by 360 degrees. The path loss of the cable was measured and entered as an offset. The peak level was recorded with resolution bandwidth 10kHz.

The measurements were performed at a 3m distance using Peak detector.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

### 2.2.6 Environmental Conditions

06 July 2009

Ambient Temperature 23.2°C

Relative Humidity 24.1%



## 2.2.7 Test Results

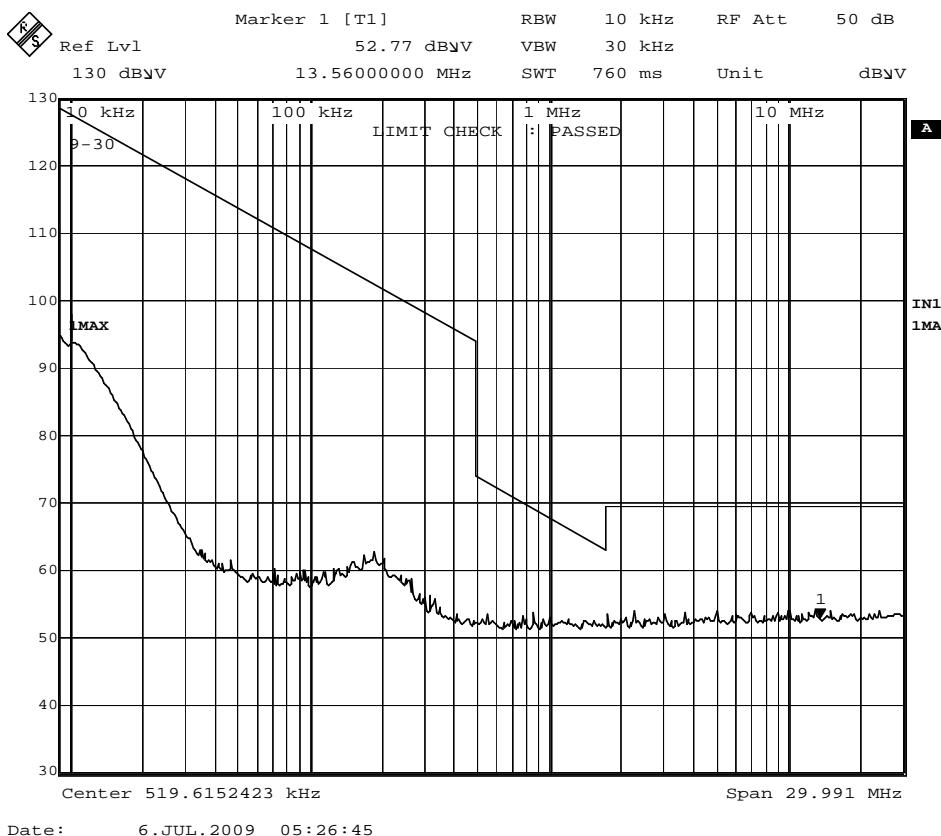
For the period of test the EUT met the requirements of FCC CFR 47 Part 15: 2008 for field strength from frequency 9kHz-30MHz.

The test results are shown below.

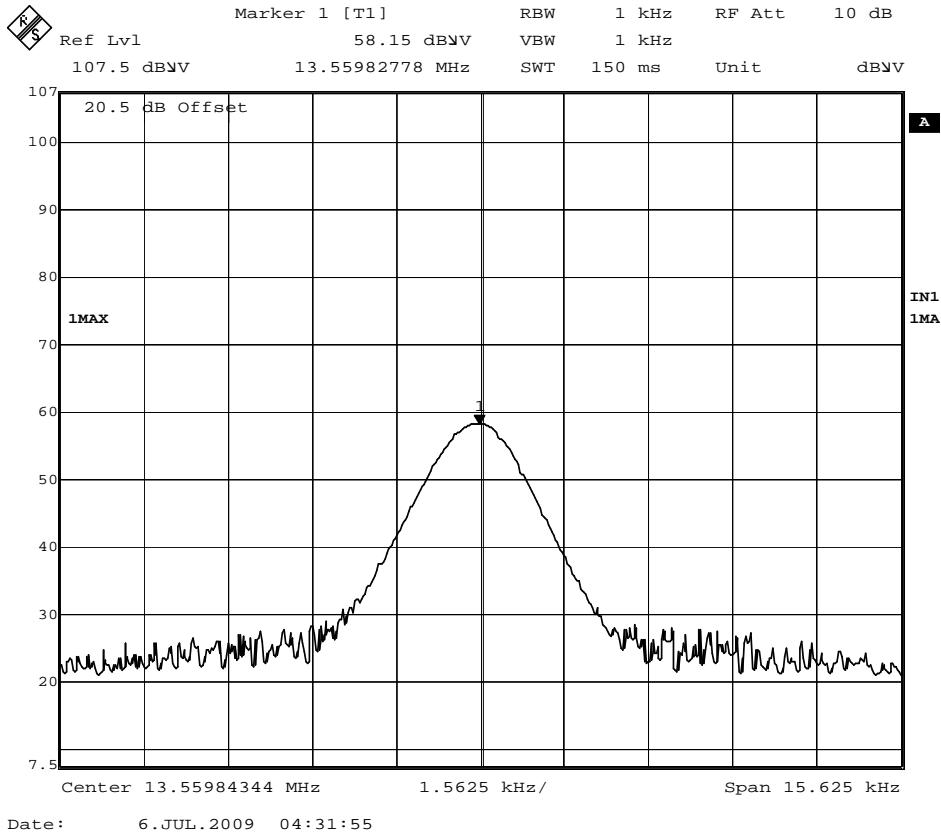
Configuration 1 - Mode 1

Frequency (MHz)	Detector	Receiver corrected reading (dB $\mu$ V/m)	Limit at 3 meter (dB $\mu$ V/m)	Margin (dB)
13.56	QP	58.15	124	65.85

The plots of test results are shown below:



Plot3: Radiated field strength in frequency band 9kHz-30MHz



Plot4: Radiated field strength of fundamental frequency

Limit level:

Frequency range (MHz)	Field Strength ( $\mu$ V/m)	Field Strength (dB $\mu$ V/m)	Measurement distance (meters)
0.009-0.490	$2400/F(\text{kHz})$	$67.6-20\log(F(\text{kHz}))$	300
0.490-1.705	$24000/F(\text{kHz})$	$87.6-20\log(F(\text{kHz}))$	30
1.705-30	30	29.5	30

Remarks

The EUT does not exceed the limit level at the measured frequencies.



## 2.3 RADIATED EMISSION 30MHZ-1GHZ

### 2.3.1 Specification Reference

FCC CFR 47 Part 15: 2008, Subpart C, Clause 15.225(d), 15.205(b), 15.209

### 2.3.2 Equipment Under Test

GSM/GPRS EFT-POS PS400

### 2.3.3 Date of Test and Modification State

06 July 2009 – Modification State 0

### 2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15: 2008.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable in a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation. The peak level was recorded with resolution bandwidth 120kHz.

Emissions identified within the range 30MHz – 1GHz were formally measured using a CISPR Quasi-Peak detector.

The measurements were performed at a 3m distance unless otherwise stated.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

### 2.3.6 Environmental Conditions

06 July 2009

Ambient Temperature 23.2°C

Relative Humidity 24.1%



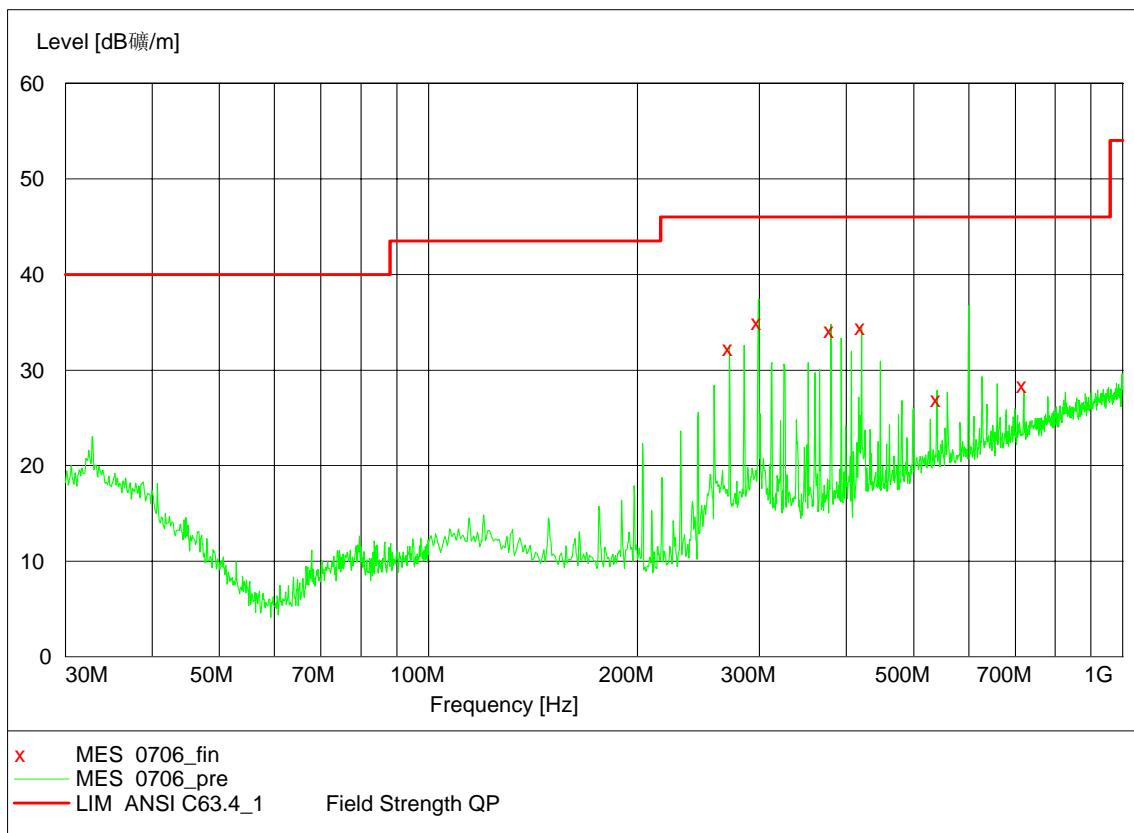
### 2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15: 2008 for Occupied Bandwidth.

#### Configuration 1 - Mode 1

Frequency (MHz)	Antenna		Azimuth (deg)	Detector	Receiver corrected reading (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Polarization	Height (cm)					
271.18	Horizontal	100	270	QP	32.3	46	13.7
298.36	Horizontal	100	270	QP	35.0	46	11.0
379.66	Horizontal	100	270	QP	34.1	46	11.9
420.34	Horizontal	100	270	QP	34.5	46	11.5
540.02	Horizontal	200	90	QP	26.9	46	19.1
720.02	Horizontal	100	270	QP	28.4	46	17.6

The plots of test results are shown below:



Plot5: Radiated field strength in frequency band 30MHz-1GHz

Limit level:

Frequency range (MHz)	Field Strength ( $\mu$ V/m)	Field Strength (dB $\mu$ V/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remarks

The EUT does not exceed the limit level at the measured frequencies.



## 2.4 BANDWIDTH OF THE EMISSION

### 2.4.1 Specification Reference

FCC CFR 47 Part 15: 2008, Subpart C, Clause 15.215(c)

### 2.4.2 Equipment Under Test

GSM/GPRS EFT-POS PS400

### 2.4.3 Date of Test and Modification State

07 July 2009 – Modification State 0

### 2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.4.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15: 2008.

The EUT was put on a remotely controlled turntable in a semi-anechoic chamber. The maximum radiated emission of the EUT was obtained using a loop antenna connected to the spectrum analyzer via an RF cable with the EUT was rotated by 360 degrees. The path loss of the cable was measured and entered as an offset, the Analyser settings were adjusted to display the resolved trace on screen. The peak point of the trace was measured and the markers positioned to give the -20dBc points of the displayed spectrum.

The measurements were performed at a 3m distance using Peak detector.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

### 2.4.6 Environmental Conditions

	07 July 2009
Ambient Temperature	24.2°C
Relative Humidity	23.3%



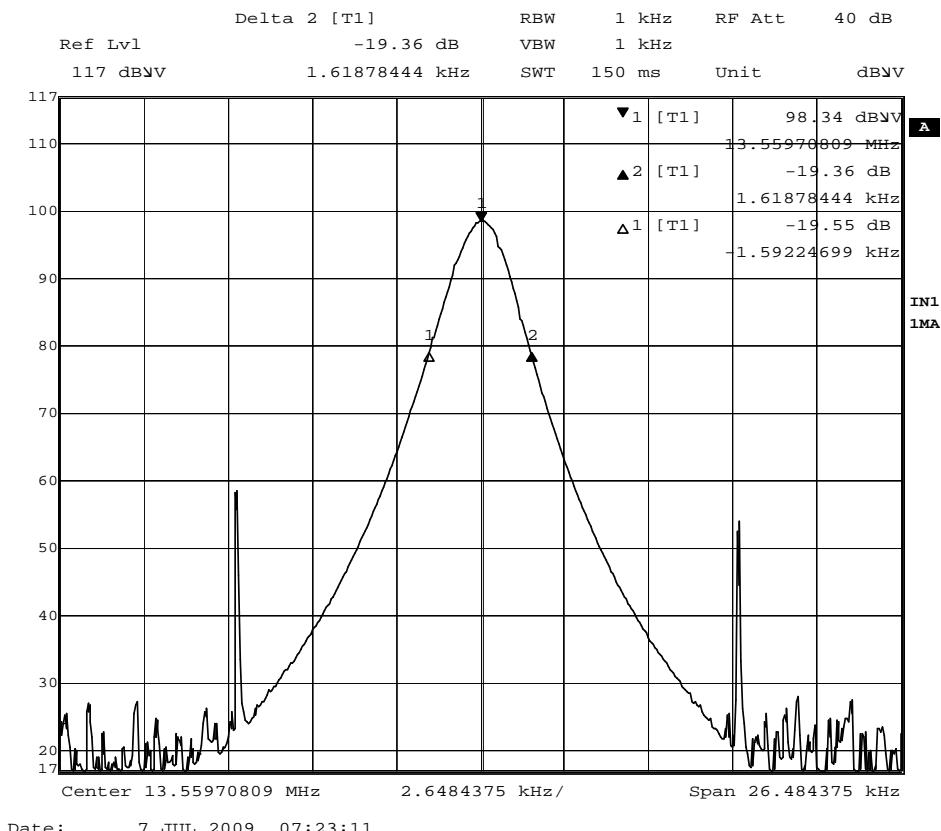
### 2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15: 2008 for Bandwidth of the emission.

20dB bandwidth reading (kHz)	Max frequency error(kHz)	Bandwidth of the emission(kHz)
3.21	-0.04931/+0.04095	3.30

The plots of test results are shown below.

#### Configuration 1 - Mode 1



Permitted operation frequency band	13.110-14.010MHz
------------------------------------	------------------

#### Remarks

The 20dB bandwidth of the emission is contained within the permitted operation frequency band.



## 2.5 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

### 2.5.1 Specification Reference

FCC CFR 47 Part 15: 2008, Subpart C, Clause 15.225(e).

### 2.5.2 Equipment Under Test

EFT-POS PS400

### 2.5.3 Date of Test and Modification State

15 January 2009 – Modification State 0

### 2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15: 2008.

The EUT was set to transmit on carrier mode. A Spectrum Analyser was used to measure the frequency error. The temperature was adjusted between  $-20^{\circ}\text{C}$  and  $+50^{\circ}\text{C}$  in  $10^{\circ}$  steps as per 15.225(e).

The test was performed with the EUT in the following modes of operation:

Configuration 1 - Mode 2

### 2.5.6 Environmental Conditions

15 January 2009

Ambient Temperature  $22.9^{\circ}\text{C}$

Relative Humidity 24.2%



### 2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15: 2008 for Frequency Stability Under Temperature Variations.

The test results are shown below.

Configuration 1 - Mode 2

7.4Vdc

Temperature Interval (°C)	Deviation (Hz)
-20	-36.9
-10	-19.98
0	13.17
+10	-38.91
+20	40.95
+30	34.98
+40	-30.87
+50	-32.48

Limit	±0.01% or ±1.356 kHz
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## 2.6 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

### 2.6.1 Specification Reference

FCC CFR 47 Part 15: 2008, Subpart C, Clause 15.225(e).

### 2.6.2 Equipment Under Test

EFT-POS PS400

### 2.6.3 Date of Test and Modification State

15 January 2009 – Modification State 0

### 2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.6.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15: 2008.

The EUT was set to transmit on carrier mode. A Spectrum Analyser was used to measure the frequency error. The supplied voltage was varied from 6.8V to 8.4V according to the specification declaration from the manufacturer at ambient temperature.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 2

### 2.6.6 Environmental Conditions

15 January 2009

Ambient Temperature 22.9°C

Relative Humidity 24.2%



## 2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 24: 2006 and Industry Canada RSS 133:2008 for Frequency Stability Under Voltage Variations.

The test results are shown below.

### Configuration 1 - Mode 2

DC Voltage (V)	Deviation (Hz)
6.8	-49.31
7.4	40.95
8.4	-43.64

Limit	±0.01% or ±1.356 kHz
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## **SECTION 3**

### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSP	1000356	2009/08/19
EMI Receiver	Rohde & Schwarz	ESI 40	100015	2009/08/19
EMI test software	Rohde & Schwarz	ES-K1	-	TU
Ultra log test antenna	Rohde & Schwarz	HL562	100167	2009/08/19
Loop antenna	Rohde & Schwarz	HFH2-Z2	100068	2009/08/19
Antenna master	Frankonia	MA 260	-	TU
Semi- Anechoic Chamber	Frankonia	23.18mx16.88mx9.60m	-	2010/09/23
Turn Table	Frankonia	PS2000	-	2009/08/19
Temperature Chamber	ESPEC	SH-241	92000389	O/P MON
Digital Multimeter	FLUKE	179	91820401	2010/01/03
Thermo-hygrometer	AZ Instruments	8705	9151655	2009/12/16

O/P MON      Output monitored with calibrated equipment  
 TU              Traceability Unscheduled



### 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Loop Antenna, AOATS	9kHz to 30MHz Amplitude	3.6dB*
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Substitution Antenna, Radiated Field	30MHz to 22GHz Amplitude	2.6dB
Worst case error for both Time and Frequency measurement 12 parts in $10^6$ .		

\* In accordance with CISPR 16-4



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## **SECTION 4**

### **DISCLAIMERS AND COPYRIGHT**



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#### 4.1 DISCLAIMERS AND COPYRIGHT

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