MRT Technology (Suzhou) Co., Ltd
Phone: +86-512-66308358
Fax: +86-512-66308368
Web: www.mrt-cert.com

Report No.: 1403RSU02701
Report Version: V01
Issue Date: 04-02-2014

MEASUREMENT REPORT

FCC PART 22H & 24E

FCC ID:	2AB4QGA222G
APPLICANT:	SHENZHEN OAK ELECTRONIC TECH. CO., LTD

Application Type:	Certification
Product:	Alarm System
Model No.:	GA222G, GA100G, GA102G, TA100G, GT333G, GA007G
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	Part2, Part22 Subpart H, Part24 Subpart E
Test Procedure(s):	ANSI/TIA-603-C-2004, KDB 971168 D01v02r01
Test Date:	March 22 ~ April 01, 2014

Reviewed By : Sunny Sun
(Sunny Sun)

Approved By : Robin Wu
(Robin Wu)

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

CONTENTS

Description Page

Revision History **4**

§2.1033 General Information **5**

1. INTRODUCTION **6**

1.1. Scope 6
1.2. MRT Test Location 6

2. PRODUCT INFORMATION **7**

2.1. Equipment Description 7
2.2. Device Capabilities 7
2.3. Test Configuration 7
2.4. EMI Suppression Device(s)/Modifications 7

3. DESCRIPTION OF TEST **8**

3.1. Evaluation Procedure 8
3.2. Cellular – Base Frequency Blocks 8
3.3. Cellular – Mobile Frequency Blocks 8
3.4. PCS – Base Frequency Blocks 8
3.5. PCS – Base Frequency Blocks 9
3.6. Occupied Bandwidth 9
3.7. Spurious and Harmonic Emissions at Antenna Terminal 9
3.8. Radiated Power and Radiated Spurious Emissions 9
3.9. Peak-Average Ratio 11
3.10. Frequency Stability / Temperature Variation 11

4. TEST EQUIPMENT CALIBRATION DATA **12**

5. SAMPLE CALCULATIONS **13**

6. MEASUREMENT UNCERTAINTY **14**

7. TEST RESULT **15**

7.1. Summary 15
7.2. OCCUPIED BANDWIDTH 16
7.2.1. Test Limit 16
7.2.2. Test Procedure used 16
7.2.3. Test Setting 16
7.2.4. Test Setup 16
7.2.5. Test Result 17
7.3. Spurious and Harmonic Emissions at Antenna Terminal 19

7.3.1. Test Limit 19
7.3.2. Test Procedure Used 19
7.3.3. Test Setting 19
7.3.4. Test Setup 19
7.3.5. Test Result 20
7.4. Radiated Power and Radiated Spurious Emissions 24
7.4.1. Test Limit 24
7.4.2. Test Procedure Used 24
7.4.3. Test Setting 24
7.4.4. Test Setup 26
7.4.5. Test Result 27
7.5. Peak-Average Ratio 30
7.5.1. Test Limit 30
7.5.2. Test Procedure 30
7.5.3. Test Setup 30
7.5.4. Test Result 31
7.6. Frequency Stability Under Temperature & Voltage Variations 32
7.6.1. Test Limit 32
7.6.2. Test Procedure 32
7.6.3. Test Setup 32
7.6.4. Test Result 33
8. CONCLUSION 35

Revision History

Report No.	Version	Description	Issue Date
1403RSU02701	Rev. 01	Initial report	04-02-2014

§2.1033 General Information

Applicant:	SHENZHEN OAK ELECTRONIC TECH. CO., LTD
Applicant Address:	Room 403, Huafeng Xinan Business Building 45th Zone, Baoan District, Shenzhen, P.R.C.
Manufacturer:	SHENZHEN OAK ELECTRONIC TECH. CO., LTD
Manufacturer Address:	Room 403, Huafeng Xinan Business Building 45th Zone, Baoan District, Shenzhen, P.R.C.
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part22 Subpart H, Part24 Subpart E
Model No.:	GA222G, GA100G, GA102G, TA100G, GT333G, GA007G
FCC ID:	2AB4QGA222G
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	PCS Licensed Transmitter (PCB)
Date(s) of Test:	March 22 ~ April 01, 2014
Test Report S/N:	1403RSU02701

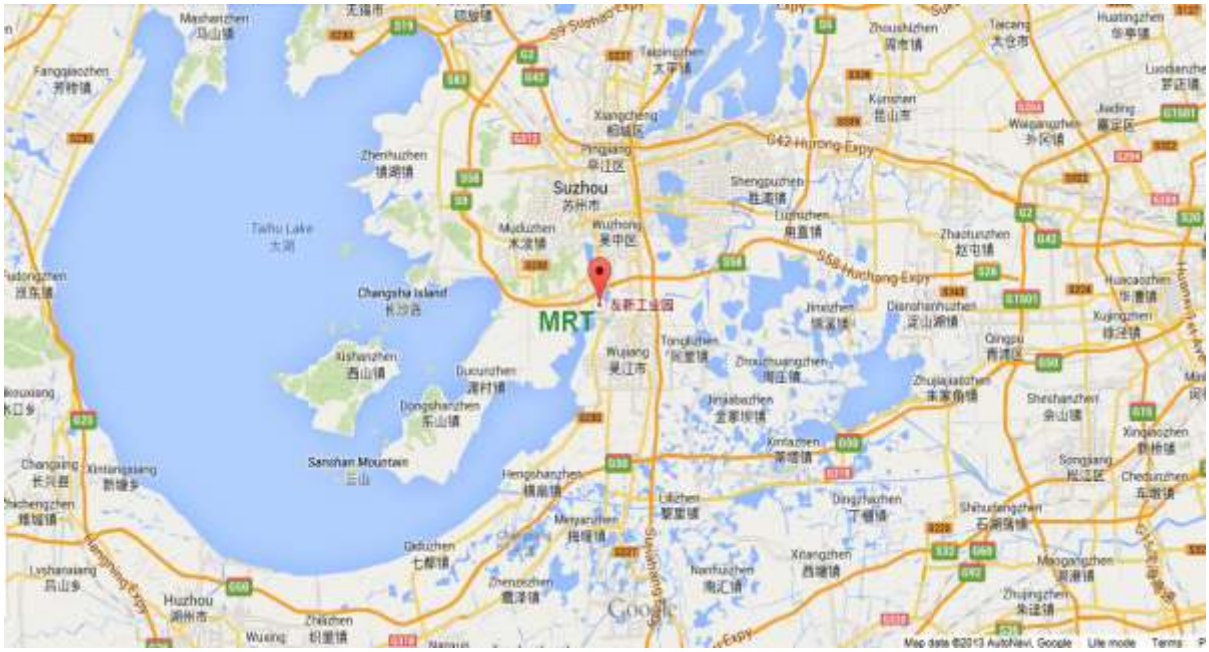
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Alarm System
Model No.	GA222G, GA100G, GA102G, TA100G, GT333G, GA007G
Antenna Type	Internal
Antenna Gain	GSM850: -1.2dBi PCS1900: -4.2dBi
Type of Modulation	GMSK

2.2. Device Capabilities

This device contains the following capabilities:
850/1900 GSM

2.3. Test Configuration

The Alarm System FCC ID: 2AB4QGA222G was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 D01v02r01. See section 3.0 of this report for a description of the radiated and antenna port conducted emissions tests.

2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

3. DESCRIPTION OF TEST

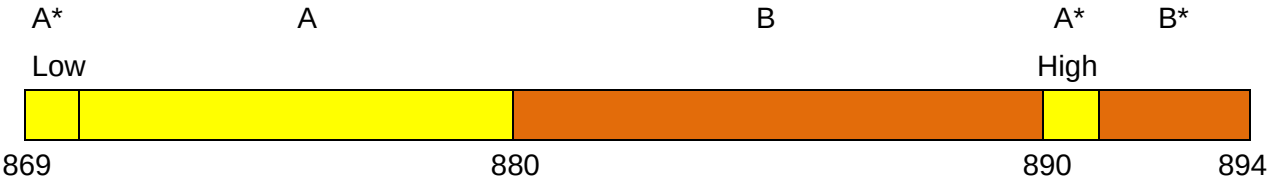
3.1. Evaluation Procedure

The measurement procedures described in the "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-C-2004) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168) were used in the measurement of **The Alarm System FCC ID: 2AB4QGA222G.**

Deviation from measurement procedure…….....None

3.2. Cellular – Base Frequency Blocks

§22.905



Block 1: 869 – 880 MHz (A* Low + A)

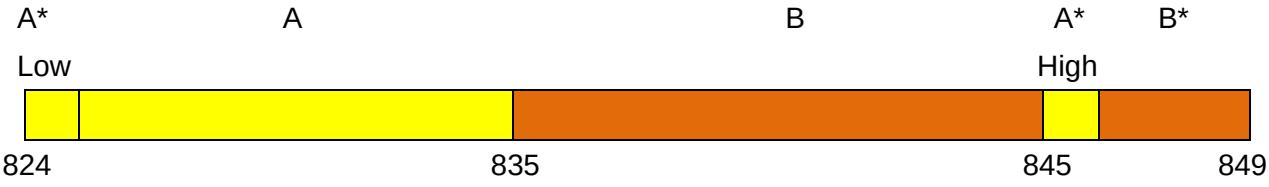
Block 2: 880 – 890 MHz (B)

Block 3: 890 – 891.5 MHz (A* High)

Block 4: 891.5 – 894 MHz (B*)

3.3. Cellular – Mobile Frequency Blocks

§22.905



Block 1: 824 – 835 MHz (A* Low + A)

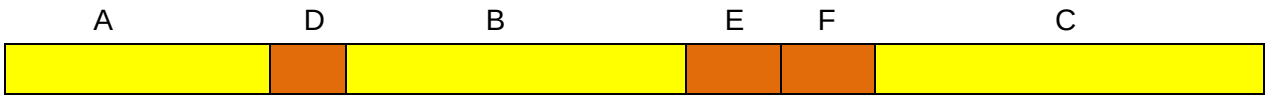
Block 2: 835 – 845 MHz (B)

Block 3: 845 – 846.5 MHz (A* High)

Block 4: 891.5 – 894 MHz (B*)

3.4. PCS – Base Frequency Blocks

§24.229



Block 1: 1930 – 1945 MHz (A)

Block 2: 1945 – 1950 MHz (D)

Block 3: 1950 – 1965 MHz (B)

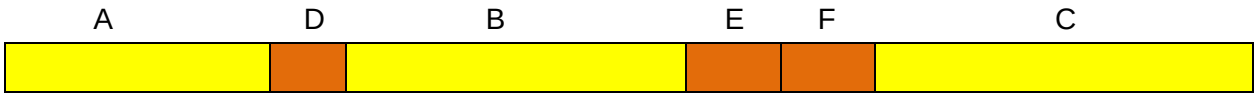
Block 4: 1965 – 1970 MHz (E)

Block 5: 1970 – 1975 MHz (F)

Block 6: 1975 – 1990 MHz (C)

3.5. PCS – Mobile Frequency Blocks

§24.229



Block 1: 1850 – 1865 MHz (A)
Block 2: 1865 – 1870 MHz (D)
Block 3: 1870 – 1885 MHz (B)
Block 4: 1885 – 1890 MHz (E)
Block 5: 1890 – 1895 MHz (F)
Block 6: 1895 – 1910 MHz (C)

3.6. Occupied Bandwidth

§2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The spectrum analyzers' "occupied bandwidth" measurement function was used to record the occupied bandwidth in accordance with KDB 971168.

3.7. Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a)

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10^{th} harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for Part 22 and 1 MHz or greater for Part 24. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

3.8. Radiated Power and Radiated Spurious Emissions

§2.1053 §22.913(a.2) §22.917(a) §24.232(c) §24.238(a)

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurement and exploratory measurements, when necessary. The measurement area is

contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 80cm high PVC support structure is placed on top of the turntable.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

Per the guidance of ANSI/TIA-603-C-2004, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

Pd [dBm] = Pg [dBm] – cable loss [dB] + antenna gain [dBd/dBi]

Where, Pd is the dipole equivalent power, Pg is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB].

The calculated Pd levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + 10*log10(Power [Watts]) specified in 22.917(a) and 24.238(a).

3.9. Peak-Average Ratio

§24.232(d)

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

For pulsed signals, the spectrum analyzer is set to use an internal “RF Burst” trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the “on time” of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power. For continuous signals, the trigger is set to “free run” in the CCDF measurement mode.

3.10. Frequency Stability / Temperature Variation

§2.1055 §22.355 §22.863 §22.905 §24.229 §24.235

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

a.) Temperature: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Emission

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cal. Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	1 year	2014/11/08
Radio Communication Tester	R&S	CMU 200	117129	1 year	2014/12/14
Preamplifier	MRT	AP01G18	1310002	1 year	2014/10/07
Preamplifier	MRT	AP18G40	1310003	1 year	2014/10/07
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	1 year	2014/11/24
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	1 year	2014/11/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	1 year	2014/11/24
Broadband Horn Antenna	Schwarzbeck	BBHA9170	9170-549	1 year	2014/12/11
Temperature/Humidity Meter	Anymetre	TH101B	AC1-01	1 year	2014/11/15

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY5144016A	1 year	2014/12/14
Radio Communication Tester	R&S	CMU 200	117129	1 year	2014/12/14
DC Power Supply	GWINSTEK	GPS-3030D	EM861052	1 year	2014/11/14
Programmable Temperature & Humidity Chamber	BAOYT	BYH-1500L	1309W043	1 year	2014/11/20
Temperature/Humidity Meter	Anymetre	TH101B	TR3-01	1 year	2014/11/15

5. SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW

GSM BW = 250 kHz

G = Phase Modulation

X = Cases not otherwise covered

W = Combination (Audio/Data)

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0dBm. The gain of the substituted antenna is 8.1dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40MHz. So 6.1 dB is added to the signal generator reading of –30.9dBm yielding –24.80dBm. The fundamental EIRP was 25.50dBm so this harmonic was 25.50dBm – (-24.80) = 50.3dBc.

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: ± 4.2dB 1GHz ~ 40GHz: ± 4.8dB

7. TEST RESULT

7.1. Summary

Company Name: **SHENZHEN OAK ELECTRONIC TECH. CO., LTD**
FCC ID: **2AB4QGA222G**
FCC Classification: **PCS Licensed Transmitter (PCB)**
Mode(s): **GSM**

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
Transmitter Mode(TX)					
2.1049	Occupied bandwidth	N/A	Conducted	Pass	Section 7.2
2.1051 22.917(a) 24.238(a)	Band Edge / Conducted Spurious Emissions	> 43 + log10 (P[Watts]) at Band Edge and for all out-of-band emissions		Pass	Section 7.3
24.232(d)	Peak-Average Ratio	< 13 dB		Pass	Section 7.5
2.1046	Transmitter Conducted Output Power	N/A		Pass	RF Exposure Report
22.913(a.2)	Effective Radiated Power	< 7 Watts max. ERP	Radiated	Pass	Section 7.4
24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP		Pass	Section 7.4
2.1053 22.917(a) 24.238(a)	Undesirable Emissions	> 43 + log10 (P[Watts]) for all out-of-band emissions		Pass	Section 7.4
2.1055 22.355 24.235	Frequency Stability	< 2.5 ppm (Part 22) Emission must remain in band (Part 24)		Pass	Section 7.6

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in Section 4.0 were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.

7.2. Occupied Bandwidth

7.2.1. Test Limit

N/A

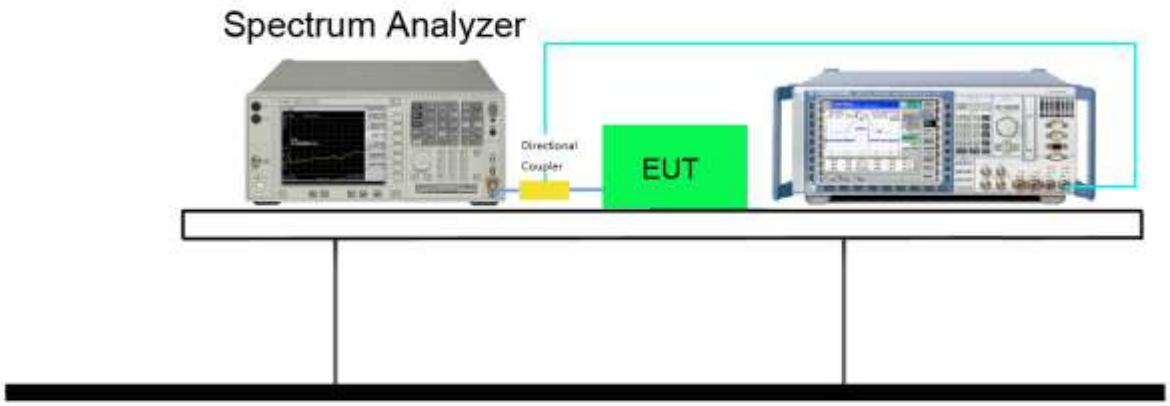
7.2.2. Test Procedure used

KDB 971168 D01v02r01 – Section 4.1 & ANSI/TIA-603-C-2004

7.2.3. Test Setting

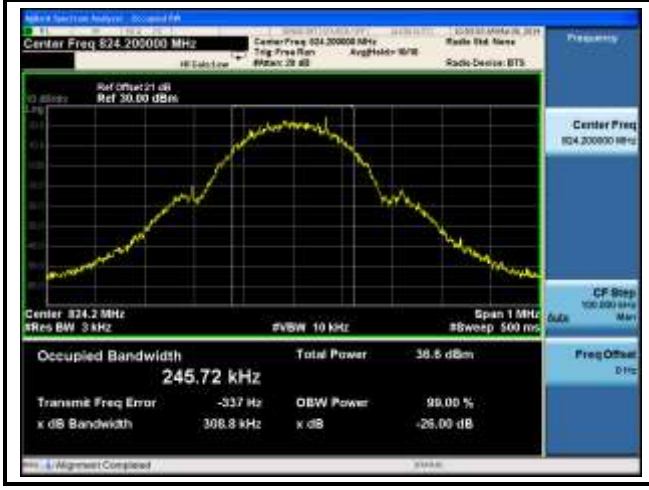
1. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW. RBW = approximately 1% of the emission bandwidth.
2. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
3. Set the detection mode to peak, and the trace mode to max hold.
4. Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

7.2.4. Test Setup



7.2.5. Test Result

Test Mode	Channel No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26dB Occupied Bandwidth (MHz)	Result
GSM850	128	824.20	0.246	0.309	Pass
	189	836.40	0.247	0.313	Pass
	251	848.80	0.245	0.317	Pass
PCS1900	512	1850.20	0.245	0.308	Pass
	661	1880.00	0.246	0.310	Pass
	810	1909.80	0.244	0.310	Pass

GSM850 Channel 128 (824.2MHz)	GSM850 Channel 189 (836.4MHz)
	

GSM850 Channel 251 (848.8MHz)	
	
PCS1900 Channel 512 (1850.2MHz)	**PCS1900 Channel 661 (1880.0MHz)**
	
PCS1900 Channel 810 (1909.8MHz)	
	

7.3. Spurious and Harmonic Emissions at Antenna Terminal

7.3.1. Test Limit

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 + 10log(P) dB.

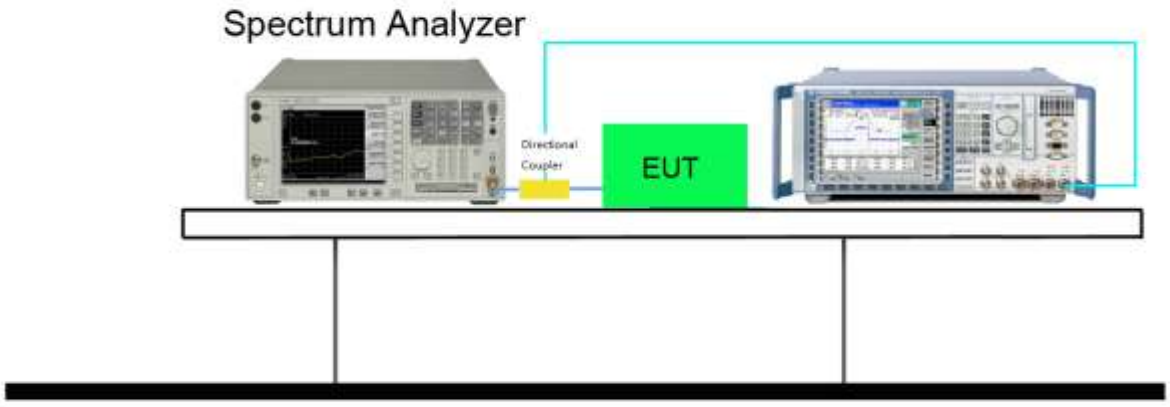
7.3.2. Test Procedure Used

KDB 971168 D01v02r01 – Section 6.0 & ANSI/TIA-603-C-2004

7.3.3. Test Setting

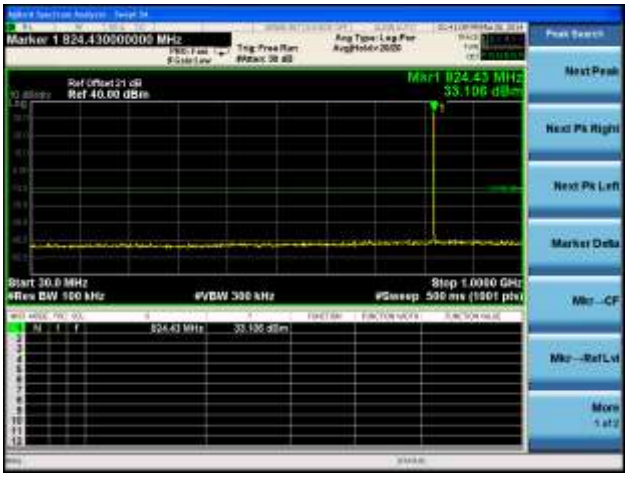
In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.

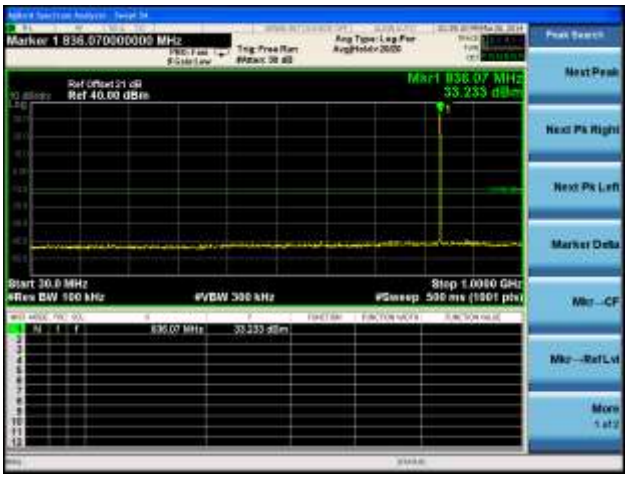
7.3.4. Test Setup



7.3.5. Test Result

Mode	Channel No.	Frequency (MHz)	Modulation	Test Result
GSM850	128	824.20	GMSK	Pass
GSM850	189	836.40	GMSK	Pass
GSM850	251	848.80	GMSK	Pass

<table>
<tr><th colspan="2">Band Edge</th></tr>
<tr><th>Channel 128 (824.20MHz)</th><th>Channel 251 (848.80MHz)</th></tr>
<tr><td>  </td><td>  </td></tr>
<tr><th colspan="2">Conducted Spurious Emission</th></tr>
<tr><th colspan="2">Channel 128 (824.20MHz)</th></tr>
<tr><td>  </td><td>  </td></tr>
</table>

Channel 189 (836.40MHz)	
	
Channel 251 (848.80MHz)	
	

Mode	Channel No.	Frequency (MHz)	Modulation	Test Result
PCS1900	512	1850.20	GMSK	Pass
PCS1900	661	1880.00	GMSK	Pass
PCS1900	810	1909.80	GMSK	Pass

Band Edge	
Channel 512 (1850.20MHz)	**Channel 810 (1909.80MHz)**
	
Conducted Spurious Emission	
Channel 512 (1850.20MHz)	
	

Channel 661 (1880.00MHz)	
	
Channel 810 (1909.80MHz)	
	

7.4. Radiated Power and Radiated Spurious Emissions

7.4.1. Test Limit

Radiated Power

For FCC Part 22.913(a)(2):

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

For FCC Part 24.232(b):

The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 2 Watts.

Radiated Spurious Emissions

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 + 10log(P) dB.

7.4.2. Test Procedure Used

KDB 971168 D01v02r01 - Section 7.0 & ANSI/TIA-603-C-2004

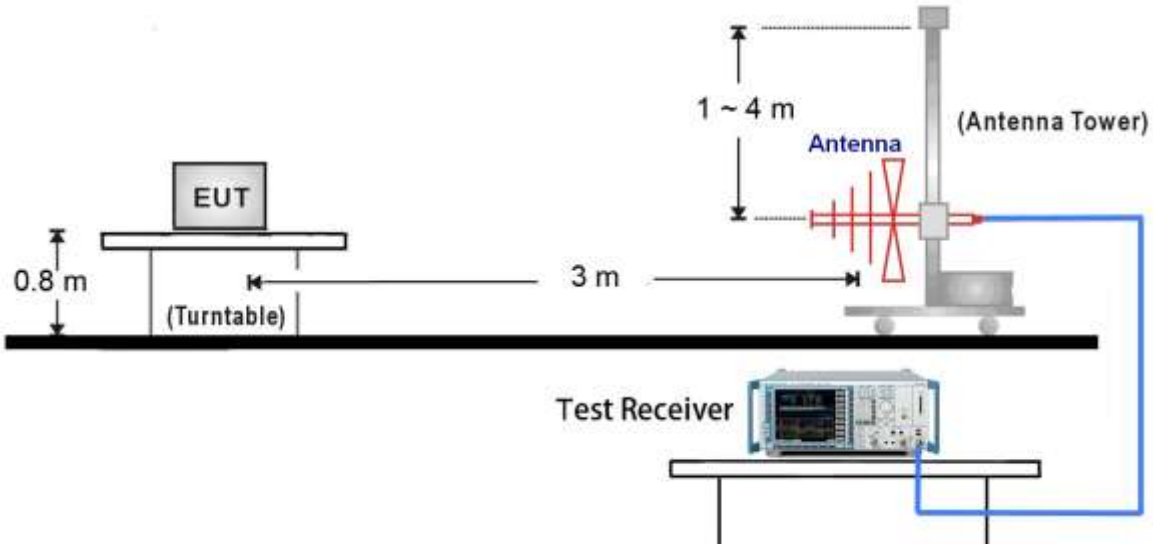
7.4.3. Test Setting

1. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
3. The output of the test antenna shall be connected to the measuring receiver.
4. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.

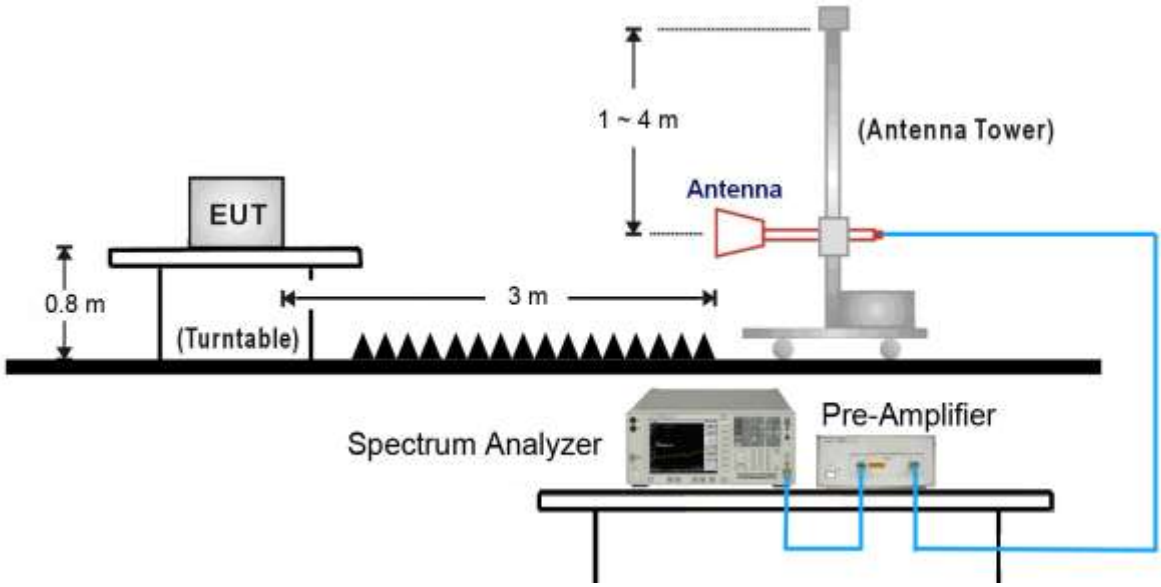
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a substitution antenna.
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
16. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
17. Test site anechoic chamber refer to ANSI C63.4: 2009.

7.4.4. Test Setup

30MHz ~ 1GHz Test Setup:



1GHz ~ 19GHz Test Setup:



7.4.5. Test Result

Radiated Power

GSM850

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Substitute Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Low Channel 128 (824.20MHz)							
824.2	H	24.42	1.78	6.52	29.16	38.50	-9.34
824.2	V	23.49	1.78	6.38	28.09	38.50	-10.41
Middle Channel 189 (836.40MHz)							
836.4	H	23.48	1.80	6.63	28.31	38.50	-10.19
836.4	V	23.08	1.80	6.15	27.43	38.50	-11.07
High Channel 251 (848.80MHz)							
848.8	H	21.73	1.82	6.80	26.71	38.50	-11.79
848.8	V	23.84	1.82	6.54	28.56	38.50	-9.94

PCS1900

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Substitute Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel 512 (1850.20MHz)							
1850.2	H	26.22	2.70	4.64	28.16	33.00	-4.84
1850.2	V	22.86	2.70	4.64	24.80	33.00	-8.20
Middle Channel 661 (1880.00MHz)							
1880.0	H	26.32	2.72	4.59	28.19	33.00	-4.81
1880.0	V	22.90	2.72	4.59	24.77	33.00	-8.23
High Channel 810 (1909.80MHz)							
1909.8	H	25.46	2.75	4.54	27.25	33.00	-5.75
1909.8	V	22.37	2.75	4.54	24.16	33.00	-8.84

NOTES:

1) This unit was tested with its standard battery.

2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The “H” positioning is defined with the EUT lying flat on the test surface, the “H2” positioning is defined with the EUT standing up on its side, and the “V” positioning is defined with the EUT standing upright. The worst case test configuration was found in the EUT in the V positioning. The data reported in the table above was measured in this test setup.

Radiated Spurious Emission

GSM850

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Substitute Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)
Low Channel 128 (824.20MHz)							
1646.0	V	-39.50	2.55	4.12	-37.93	-13	-24.93
2572.5	V	-54.62	3.21	8.40	-49.43	-13	-36.43
1646.0	H	-34.12	2.55	5.12	-31.55	-13	-18.55
2572.5	H	-52.60	3.21	9.22	-46.59	-13	-33.59
Middle Channel 189 (836.40MHz)							
1671.5	V	-39.34	2.57	4.62	-37.29	-13	-24.29
2572.5	V	-53.50	3.21	8.40	-48.31	-13	-35.31
1671.5	H	-33.70	2.57	5.40	-30.87	-13	-17.87
2572.5	H	-51.43	3.21	9.22	-45.42	-13	-32.42
High Channel 251 (848.80MHz)							
1697.0	V	-39.31	2.59	4.99	-36.91	-13	-23.91
2572.5	V	-54.33	3.21	8.40	-49.14	-13	-36.14
1697.0	H	-35.12	2.59	5.36	-32.35	-13	-19.35
2572.5	H	-53.17	3.21	9.22	-47.16	-13	-34.16

Note: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

PCS1900

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Substitute Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low Channel 512 (1850.20MHz)							
3703.0	V	-38.35	3.90	11.56	-30.69	-13	-17.69
5547.5	V	-41.71	4.85	14.94	-31.62	-13	-18.62
3703.0	H	-37.39	3.90	11.71	-29.58	-13	-16.58
5547.5	H	-42.62	4.85	15.06	-32.41	-13	-19.41
Middle Channel 661 (1880.00MHz)							
3762.5	V	-42.41	3.94	11.89	-34.46	-13	-21.46
5641.0	V	-39.24	4.94	15.03	-29.15	-13	-16.15
3762.5	H	-37.70	3.94	11.70	-29.94	-13	-16.94
5641.0	H	-39.39	4.94	14.91	-29.42	-13	-16.42
High Channel 810 (1909.80MHz)							
3822.0	V	-38.80	3.98	12.26	-30.52	-13	-17.52
5726.0	V	-39.99	5.00	14.82	-30.17	-13	-17.17
3822.0	H	-37.06	3.98	12.39	-28.65	-13	-15.65
5726.0	H	-39.87	5.00	14.94	-29.93	-13	-16.93

Note: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

7.5. Peak-Average Ratio

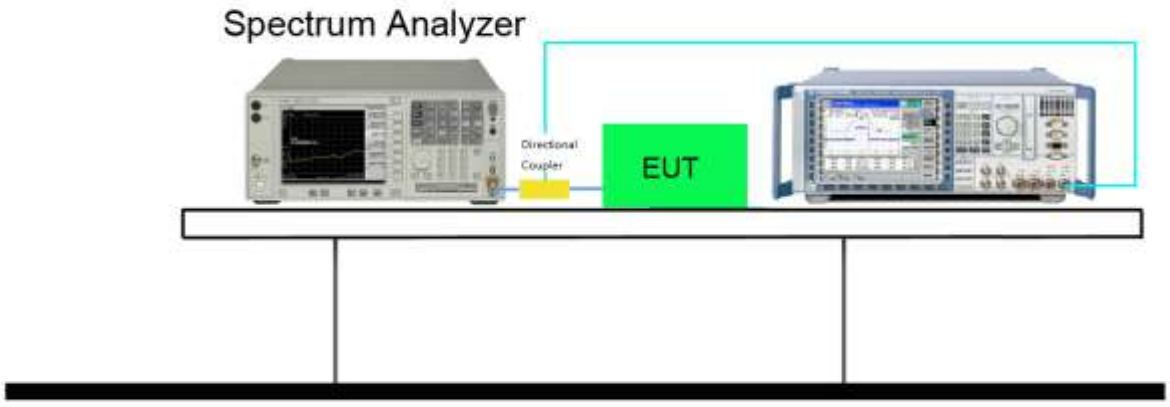
7.5.1. Test Limit

The transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

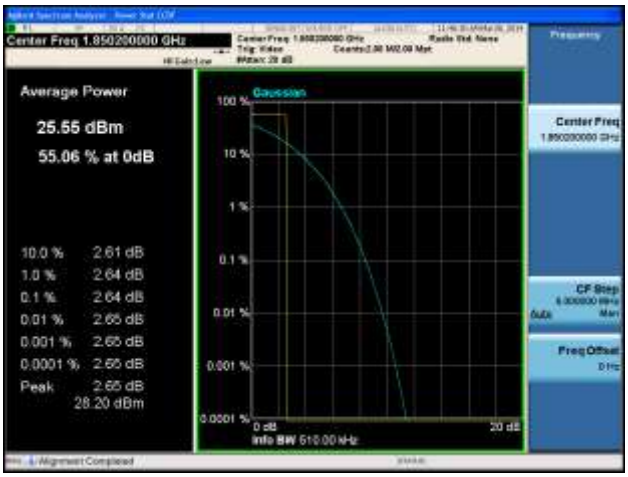
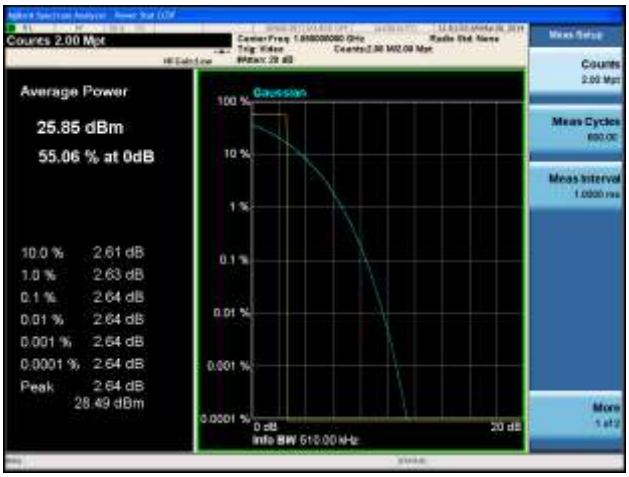
7.5.2. Test Procedure

KDB 971168 D01v02r01 - Section 5.7 & ANSI/TIA-603-C-2004

7.5.3. Test Setup



7.5.4. Test Result

Peak-Average Ratio	
PCS1900 Channel 512 (1850.2MHz)	**PCS1900 Channel 661 (1880.0MHz)**
	
PCS1900 Channel 810 (1909.8MHz)	
	

7.6. Frequency Stability Under Temperature & Voltage Variations

7.6.1. Test Limit

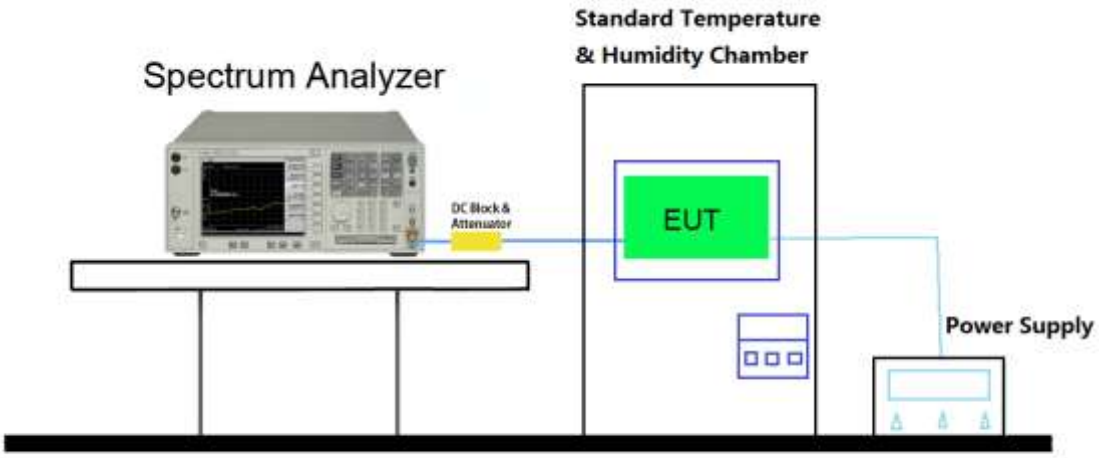
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Limit	< ± 2.5 ppm

7.6.2. Test Procedure

KDB 971168 D01v02r01 - Section 9.0 & ANSI/TIA-603-C-2004

7.6.3. Test Setup



7.6.4. Test Result

OPERATING FREQUENCY	836,400,000 Hz
CHANNEL	189
TEST MODE	GSM850
REFERENCE VOLTAGE	3.7 VDC
DEVIATION LIMIT	±0.00025% or 2.5ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.7	+20(Ref)	836,400,000	23	0.000003
100%		-30	836,400,000	22	0.000003
100%		-20	836,400,000	49	0.000006
100%		-10	836,400,000	-25	-0.000003
100%		0	836,400,000	14	0.000002
100%		+10	836,400,000	37	0.000004
100%		+20	836,400,000	23	0.000003
100%		+30	836,400,000	-13	-0.000002
100%		+40	836,400,000	-31	-0.000004
100%		+50	836,400,000	22	0.000003
115%	4.2	+20	836,400,000	16	0.000002
BAT.ENDPOINT	3.6	+20	836,400,000	-18	-0.000002

OPERATING FREQUENCY	1,880,000,000 Hz
CHANNEL	661
TEST MODE	PCS1900
REFERENCE VOLTAGE	3.7 VDC
DEVIATION LIMIT	±0.00025% or 2.5ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.7	+20(Ref)	1,880,000,000	-26	-0.000001
100%		-30	1,880,000,000	47	0.000002
100%		-20	1,880,000,000	-30	-0.000002
100%		-10	1,880,000,000	-33	-0.000002
100%		0	1,880,000,000	48	0.000003
100%		+10	1,880,000,000	28	0.000002
100%		+20	1,880,000,000	-26	-0.000001
100%		+30	1,880,000,000	43	0.000002
100%		+40	1,880,000,000	-29	-0.000002
100%		+50	1,880,000,000	-13	-0.000001
115%	4.2	+20	1,880,000,000	37	0.000002
BAT.ENDPOINT	3.6	+20	1,880,000,000	48	0.000003

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Alarm System FCC ID: 2AB4QGA222G** compliance with all the requirements of Parts 2, 22, 24 of the FCC Rules.

The End