



## Test Report

Product Name	Small Door Sensor
Model No.	HSM01-0
FCC ID	ZGXHSM01

Applicant	Chromagic Technologies Corporation
Address	5 of 2nd Fl., No.611, Sec.1, Wanshou Rd., Kwei Shan, Taoyuan Hsien 333, Taiwan.

Date of Receipt	April 07, 2011
Issued Date	May 06, 2011
Report No.	114123R-RFUSP27V01
Report Version	V1.0

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.  
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

# Test Report Certification

Issued Date: May 06, 2011

Report No.: 114123R-RFUSP27V01



Product Name	Small Door Sensor
Applicant	Chromagic Technologies Corporation
Address	5 of 2nd Fl., No.611, Sec.1, Wanshou Rd., Kwei Shan, Taoyuan Hsien 333, Taiwan.
Manufacturer	Chromagic Technologies Corporation
Model No.	HSM01-0
EUT Rated Voltage	DC 3V (Power by Battery)
EUT Test Voltage	DC 3V (Power by Battery)
Trade Name	CTC
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2010 ANSI C63.4: 2009
Test Result	Complied



Test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By :

A handwritten signature in blue ink that appears to read "Rita Huang".

( Senior Adm. Specialist / Rita Huang )



Tested By :

A handwritten signature in blue ink that appears to read "Vincent Chu".

( Engineer / Vincent Chu )



Approved By :

A handwritten signature in blue ink that appears to read "Vincent Lin".

( Manager / Vincent Lin )

## TABLE OF CONTENTS

Description	Page
<b>1. GENERAL INFORMATION .....</b>	<b>4</b>
1.1. EUT Description.....	4
1.2. Operational Description .....	5
1.3. Tested System Details.....	6
1.4. Configuration of Test System .....	6
1.5. EUT Exercise Software .....	6
1.6. Test Facility .....	7
<b>2. Conducted Emission.....</b>	<b>8</b>
2.1. Test Equipment.....	8
2.2. Test Setup .....	8
2.3. Limits .....	8
2.4. Test Procedure .....	9
2.5. Uncertainty .....	9
2.6. Test Result of Conducted Emission.....	10
<b>3. Radiated Emission.....</b>	<b>11</b>
3.1. Test Equipment.....	11
3.2. Test Setup .....	12
3.3. Limits .....	13
3.4. Test Procedure .....	13
3.5. Uncertainty .....	14
3.6. Test Result of Radiated Emission.....	15
<b>4. Band Edge .....</b>	<b>22</b>
4.1. Test Equipment.....	22
4.2. Test Setup .....	22
4.3. Limits .....	23
4.4. Test Procedure .....	23
4.5. Uncertainty .....	23
4.6. Test Result of Band Edge .....	24
<b>5. Duty Cycle .....</b>	<b>26</b>
5.1. Test Equipment.....	26
5.2. Test Setup .....	26
5.3. Uncertainty .....	26
5.4. Test Result of Duty Cycle.....	27
<b>6. EMI Reduction Method During Compliance Testing .....</b>	<b>28</b>

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Small Door Sensor
Trade Name	CTC
Model No.	HSM01-0
FCC ID	ZGXHSM01
Frequency Range	923MHz
Channel Control	N/A
Antenna Type	Monopole
Channel Number	1
Type of Modulation	FSK

Note:

1. The EUT is a Small Door Sensor with a built-in 923MHz transceiver.
2. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

## 1.2. Operational Description

The EUT is a Small Door Sensor with a built-in 923MHz transceiver. The EUT operation frequency is 923MHz. The signals modulated by FSK are transmitted from the Monopole Antenna of the EUT.

The sensors are standard magnetic door sensors used in security applications.

Test Mode	Mode 1: Transmit
-----------	------------------

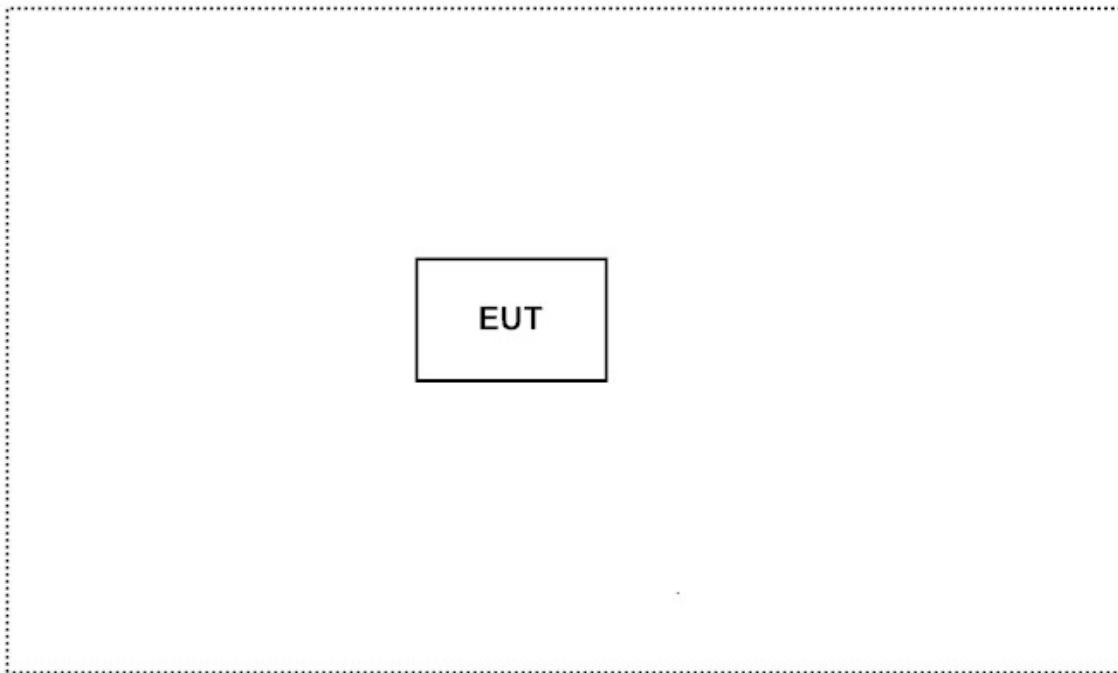
### 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
(1) N/A	N/A	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
A. N/A	N/A

### 1.4. Configuration of Test System



### 1.5. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4
- (2) Inserts the battery, start continuous transmit
- (3) Verify that the EUT works correctly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : <http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

Site Description: File on

Federal Communications Commission  
FCC Engineering Laboratory  
7435 Oakland Mills Road  
Columbia, MD 21046  
Registration Number: 92195



Accreditation on NVLAP  
NVLAP Lab Code: 200533-0



Site Name: Quietek Corporation  
Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,  
Lin-Kou Shiang, Taipei,  
Taiwan, R.O.C.  
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789  
E-Mail : [service@quietek.com](mailto:service@quietek.com)

FCC Accreditation Number: TW1014



## 2. Conducted Emission

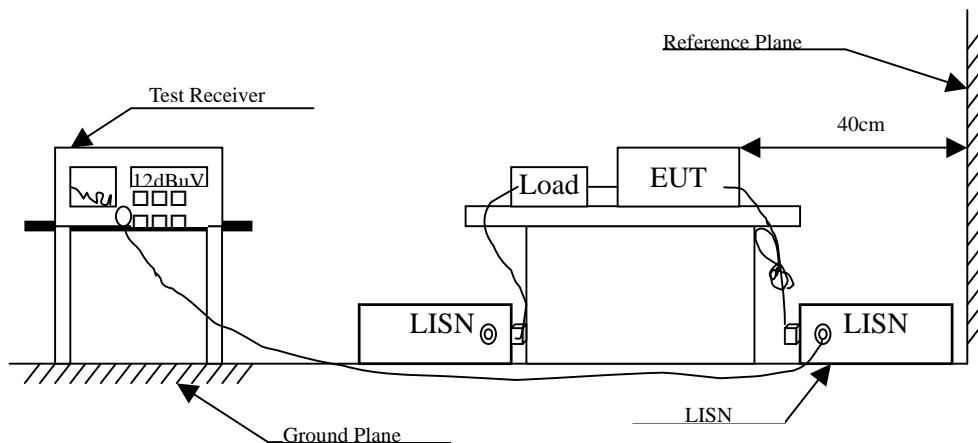
### 2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2011	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2011	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2011	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2011	
5	No.1 Shielded Room				N/A

Note: All instruments are calibrated every one year.

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

## **2.4. Test Procedure**

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2009 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

## **2.5. Uncertainty**

± 2.26 dB

## **2.6. Test Result of Conducted Emission**

Owing to the EUT use battery supply voltage, this test item is not performed.

### 3. Radiated Emission

#### 3.1. Test Equipment

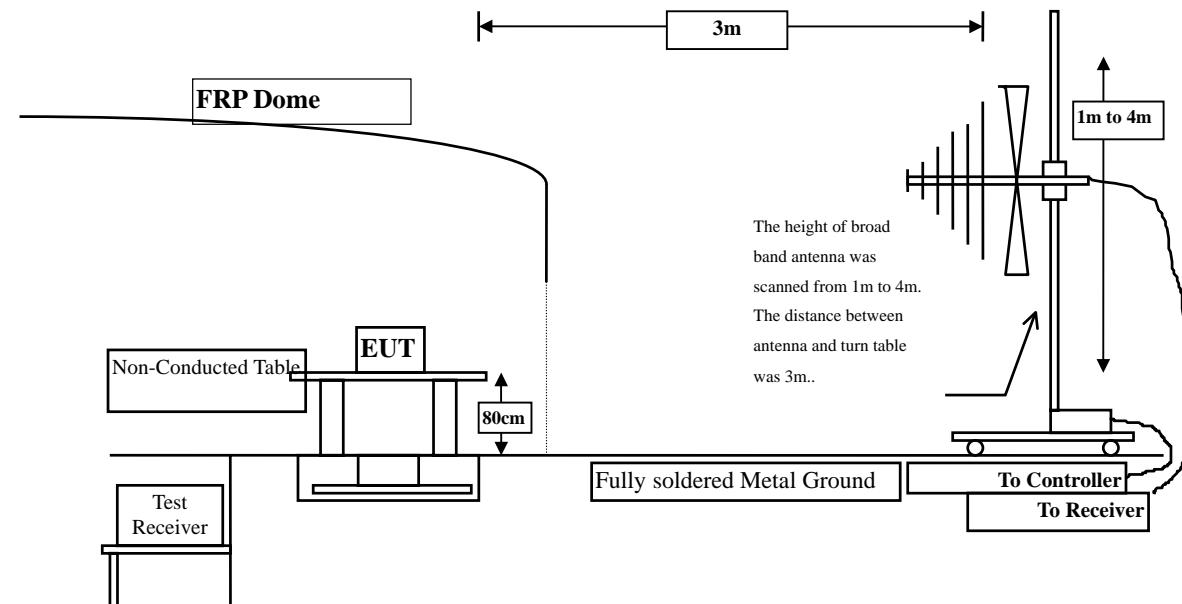
The following test equipment are used during the radiated emission test:

Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2010
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2010
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2010
	X	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2010
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2011
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2010
	X	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2011
	X	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

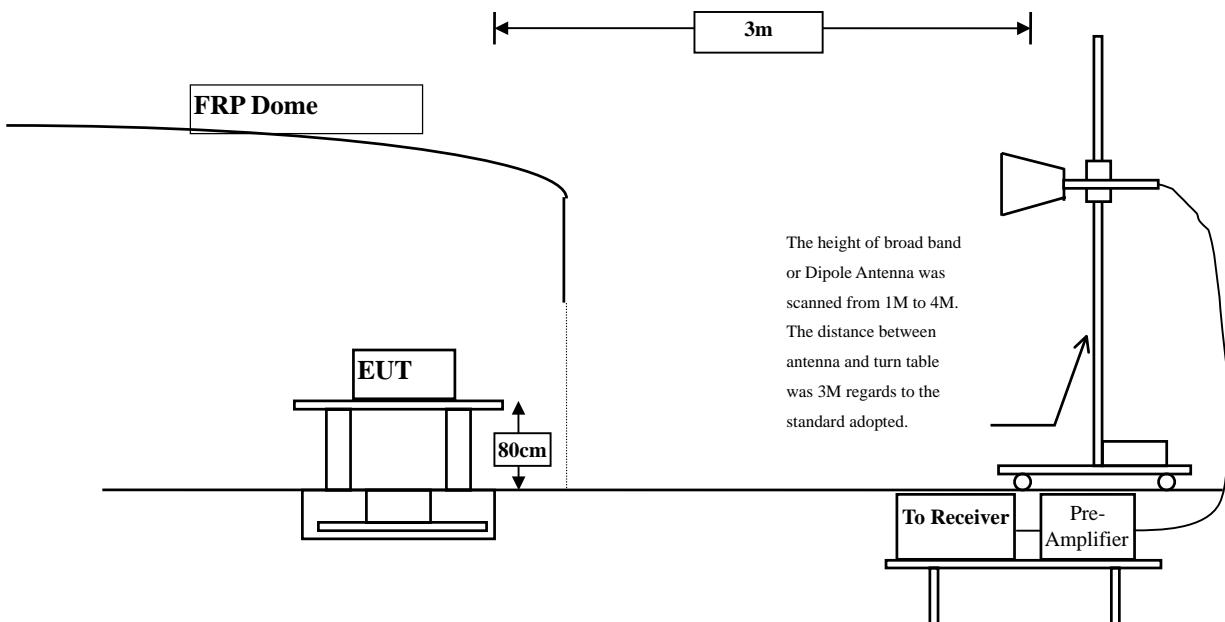
Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.  
2. The test instruments marked with "X" are used to measure the final test results.

### 3.2. Test Setup

#### Radiated Emission Below 1GHz



#### Radiated Emission Above 1GHz



### 3.3. Limits

#### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

### 3.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested compliance to FCC 47CFR 15.249 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2009 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 30MHz - 10th Harmonic of fundamental was investigated.

### **3.5. Uncertainty**

$\pm$  3.9 dB above 1GHz

$\pm$  3.8 dB below 1GHz

### 3.6. Test Result of Radiated Emission

Product : Small Door Sensor  
Test Item : Fundamental Radiated Emission  
Test Site : No.3OATS  
Test Mode : Mode 1: Transmit (X- Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
923.000	6.295	90.080	96.375	-17.625	114.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
923.000	5.532	79.100	84.632	-29.368	114.000

Note:

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

**Average Detector:**

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Correct Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------------	------------------------------------	--------------------------------	--------------	-----------------

**Horizontal****Average Detector:**

923.00	96.375	-30.173	66.202	-27.798	94.000
--------	--------	---------	--------	---------	--------

**Vertical****Average Detector:**

--

## Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Small Door Sensor  
 Test Item : Fundamental Radiated Emission  
 Test Site : No.3OATS  
 Test Mode : Mode 1: Transmit (Y- Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

**Horizontal**
**Peak Detector:**

923.000	6.295	85.450	91.745	-22.255	114.000
---------	-------	--------	--------	---------	---------

**Vertical**
**Peak Detector:**

923.000	5.532	77.190	82.722	-31.278	114.000
---------	-------	--------	--------	---------	---------

**Note:**

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Small Door Sensor  
Test Item : Fundamental Radiated Emission  
Test Site : No.3OATS  
Test Mode : Mode 1: Transmit (Z- Axis)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
923.000	6.295	72.770	79.065	-34.935	114.000
 <b>Vertical</b>					
<b>Peak Detector:</b>					
923.000	5.532	87.110	92.642	-21.358	114.000

**Note:**

1. Measurement Level = Reading Level + Correct Factor.
2. Correct Factor = Antenna Factor + Cable Loss – PreAMP.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Small Door Sensor  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
1846.000	-4.230	47.610	43.380	-30.620	74.000
2769.000	-0.785	38.140	37.355	-36.645	74.000
3692.000	-0.973	44.210	43.237	-30.763	74.000
4615.000	2.092	38.150	40.242	-33.758	74.000
5538.000	4.584	36.700	41.284	-32.716	74.000
6461.000	7.433	36.590	44.023	-29.977	74.000
7384.000	12.074	36.090	48.164	-25.836	74.000
8307.000	29.111	18.720	47.830	-26.170	74.000
9230.000	12.992	36.420	49.412	-24.588	74.000

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Small Door Sensor  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Vertical</b>					
<b>Peak Detector:</b>					
1846.000	-2.941	38.640	35.699	-38.301	74.000
2769.000	-0.968	38.160	37.192	-36.808	74.000
3692.000	0.171	39.800	39.971	-34.029	74.000
4615.000	5.939	37.870	43.809	-30.191	74.000
5538.000	6.081	36.620	42.701	-31.299	74.000
6461.000	8.667	36.700	45.368	-28.632	74.000
7384.000	13.192	34.790	47.982	-26.018	74.000
8307.000	16.723	35.540	52.262	-21.738	74.000
9230.000	12.923	36.040	48.964	-25.036	74.000

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Small Door Sensor  
 Test Item : General Radiated Emission Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Horizontal</b>					
293.840	-3.868	27.870	24.003	-21.997	46.000
377.260	-1.115	27.494	26.379	-19.621	46.000
460.680	1.589	25.808	27.397	-18.603	46.000
602.300	4.287	27.745	32.032	-13.968	46.000
734.530	2.648	35.806	38.454	-7.546	46.000
932.100	6.922	31.294	38.216	-7.784	46.000
<b>Vertical</b>					
103.720	-0.151	25.980	25.828	-17.672	43.500
371.440	-2.737	27.405	24.668	-21.332	46.000
501.420	-0.795	25.365	24.570	-21.430	46.000
685.720	2.319	25.258	27.576	-18.424	46.000
809.880	3.279	31.193	34.472	-11.528	46.000
926.280	5.821	26.044	31.865	-14.135	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

## 4. Band Edge

### 4.1. Test Equipment

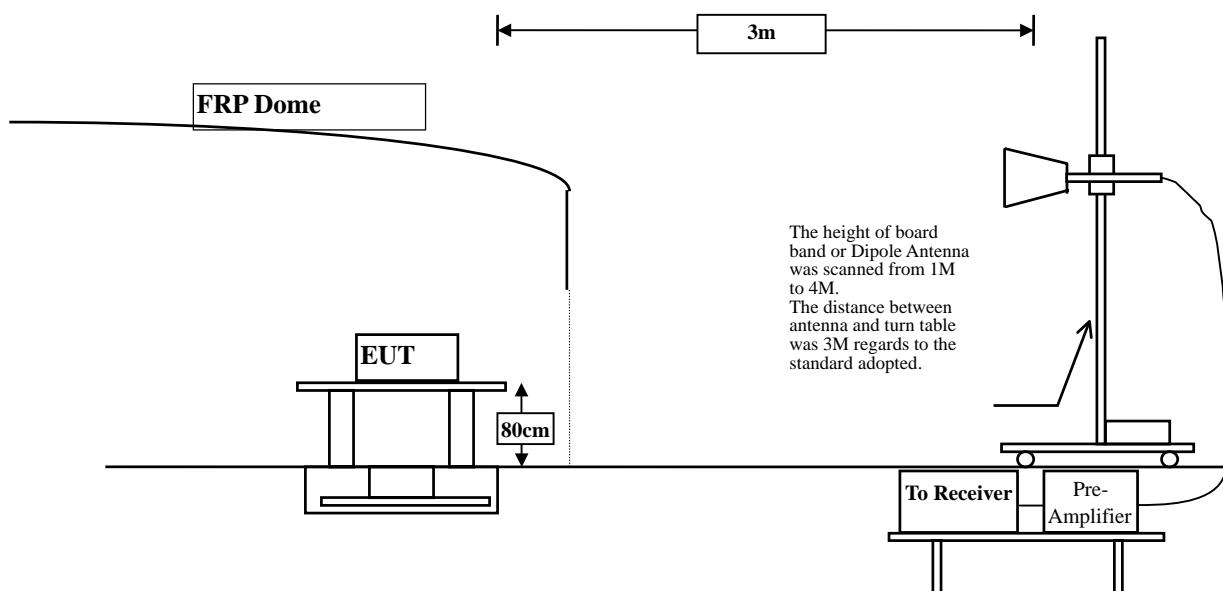
The following test equipments are used during the band edge tests:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2010
	X Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2010
	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2010
	X Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2010
	X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2011
	X Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2010
	X Coaxial Cable	QTK	QTK-CABLE/ CAB5	Feb., 2011
	X Controller	QTK	QTK-CONTROLLER/ CTRL3	N/A
	X Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All equipments are calibrated every one year.  
 2. The test equipments marked by “X” are used to measure the final test results.

### 4.2. Test Setup

#### RF Radiated Measurement:



#### **4.3. Limits**

Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

#### **4.4. Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2009 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

#### **4.5. Uncertainty**

Conducted is  $\pm$  1.27 dB

Radiated is  $\pm$  3.9 dB

#### 4.6. Test Result of Band Edge

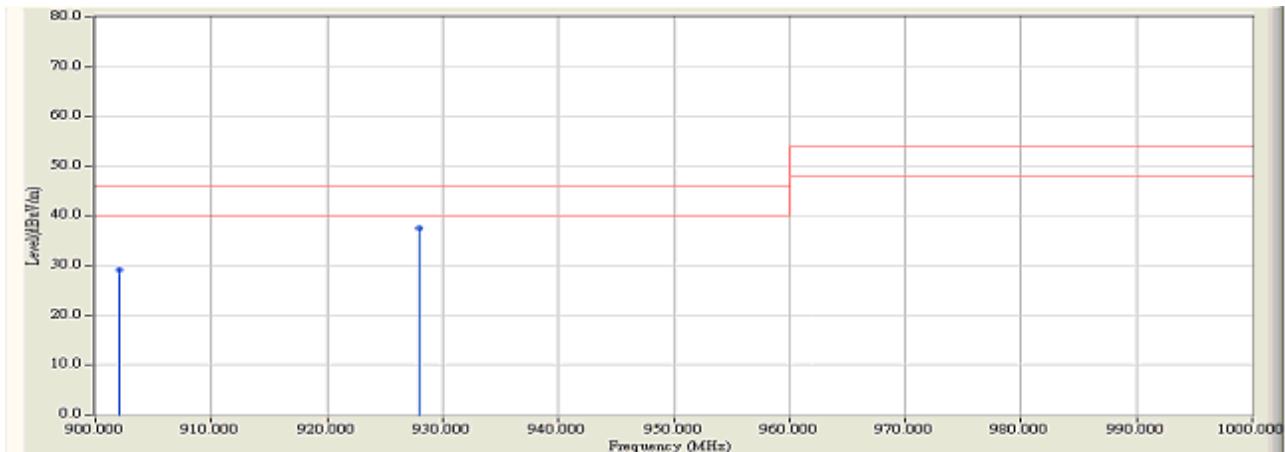
Product : Small Door Sensor  
Test Item : Band Edge Data  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit

##### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Margin (dB)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	2.778	26.320	29.098	-16.922	46.020	Pass
01(Quasi-Peak)	928.000	3.074	34.430	37.504	-8.516	46.020	Pass

Figure Channel 01:

Horizontal (Quasi-Peak)



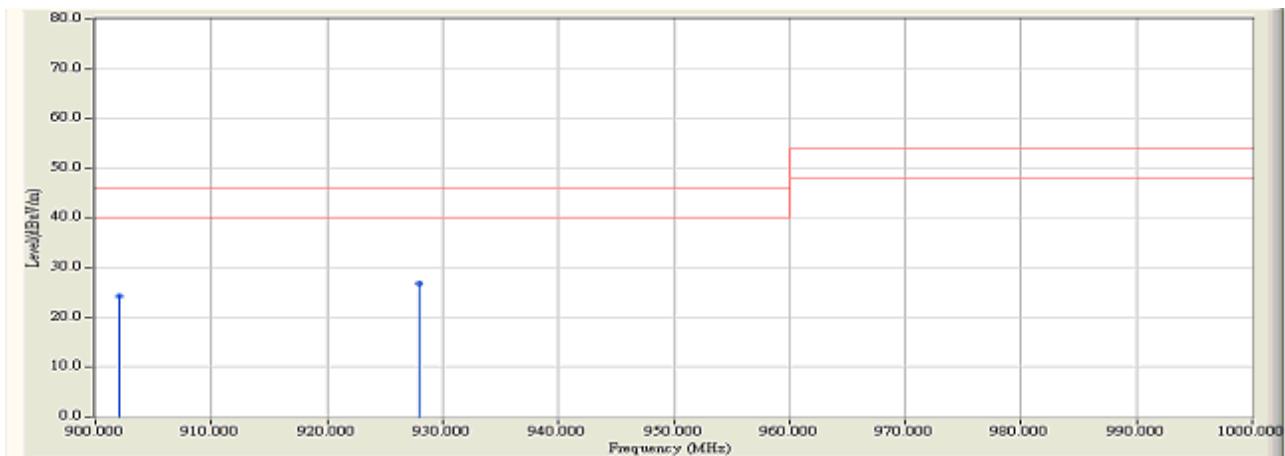
Note:

1. Quasi-Peak measurements: RBW=100kHz, VBW=1MHz, Sweep: Auto.
2. “\*”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Product : Small Door Sensor  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit

**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Margin (dB)	Quasi-Peak Limit (dBuV/m)	Result
01(Quasi-Peak)	902.000	3.928	20.320	24.248	-21.772	46.020	Pass
01(Quasi-Peak)	928.000	4.054	22.750	26.804	-19.216	46.020	Pass

**Figure Channel 01:**
**Vertical (Quasi-Peak)**


Note:

1. Quasi-Peak measurements: RBW=100kHz,VBW=1MHz,Sweep: Auto.
2. “\*”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

## 5. Duty Cycle

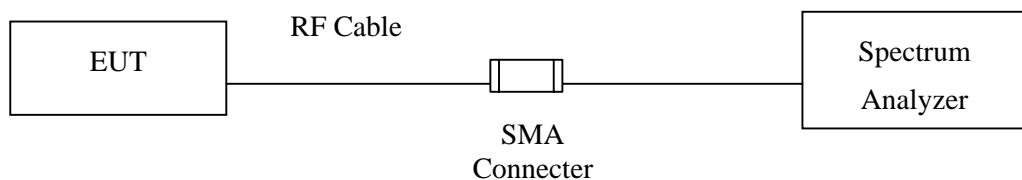
### 5.1. Test Equipment

The following test equipments are used during the band edge tests:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2011

Note: 1. All equipments are calibrated every one year.  
2. The test equipments marked by “X” are used to measure the final test results.

### 5.2. Test Setup

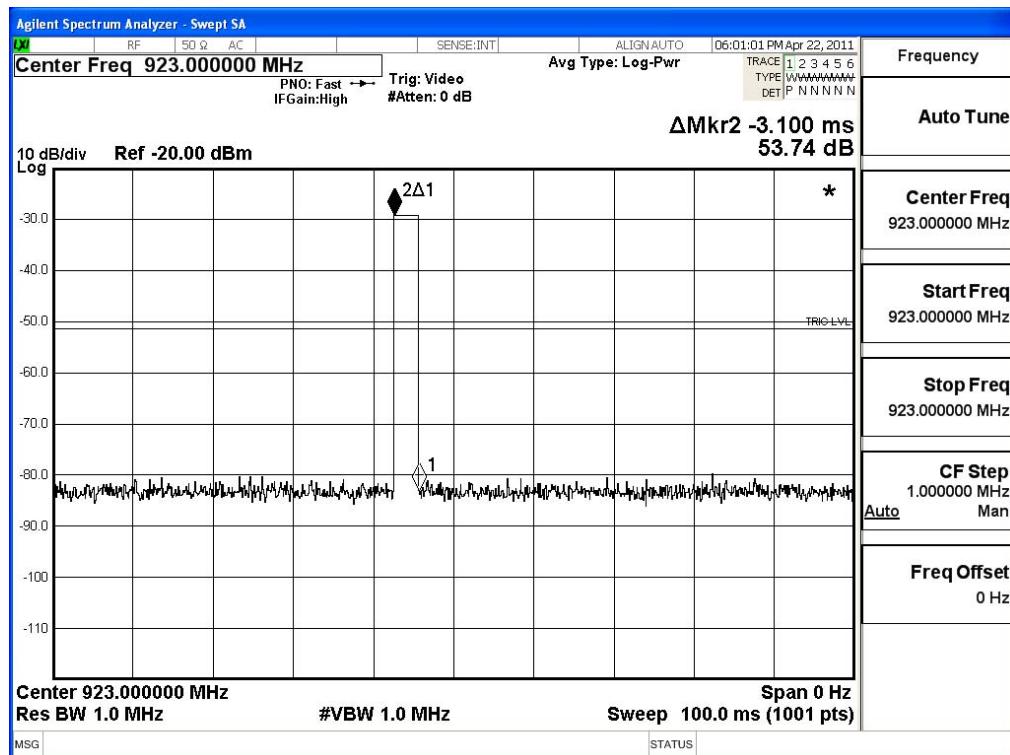


### 5.3. Uncertainty

± 150Hz

## 5.4. Test Result of Duty Cycle

Product : Small Door Sensor  
 Test Item : Duty Cycle Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit



Time on of 100ms= 3.100 ms

Duty Cycle= 3.1ms / 100ms= 0.031

Duty Cycle correction factor= 20 LOG 0.031= -30.173 dB

Duty Cycle correction factor	-30.173	dB
------------------------------	---------	----

**6. EMI Reduction Method During Compliance Testing**

No modification was made during testing.

Attachment 1: EUT Test Photographs

## Attachment 2: EUT Detailed Photographs