

# TEST REPORT

<b>Report Number</b>		RAPA11-O-345
<b>Type of Equipment</b>		Keyless Entry System
<b>Model Name</b>		FTX1400R-AM
<b>FCC ID</b>		VA5JR500-1A433
<b>IC Number</b>		7087A-R500A433
<b>Applicant</b>	<b>Name</b>	SEGI LIMITED
	<b>Logo</b>	<b>SEGI</b>
	<b>Address</b>	Room 1808, 18/F, Tower 2, Admiralty Center, 18 Harcourt Rd., Hongkong city, 186, China
<b>Manufacturer</b>	<b>Name</b>	SEGI ELECTRONICS CO., LTD.
	<b>Address</b>	Chenjiapucun, Liaobu Town, Dongguan City, Guandong Province, China
<b>Date of reception</b>		September 5, 2011
<b>Date of test</b>		September 5, 2011 to September 23, 2011
<b>Date of issue</b>		September 26, 2011
<b>Total Page</b>		15 pages (including this page)

## SUMMARY

The equipment complies with FCC CFR 47 Part 15 Subpart C Section 15.231 and IC RSS-210 Issue8 Annex I-2010.

This test report contains only the results of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Date : September 26, 2011



Tested by Chang Young, Choi  
Duplicy General Manager

Date : September 26, 2011



Reviewed by Sukil, Park  
Executive Managing Director

## CONTENTS

	<u>Page</u>
<b>1. General description of EUT</b>	3
1.1 Applicant	3
1.2 Manufacturer	3
1.3 Basic description of EUT	3
1.4 Technical specification of EUT	4
<b>2. General information of test</b>	5
2.1 Applied standards for measurement	5
2.2 Description of EUT modification	5
2.3 Test configuration	5
<b>3. Measurement data</b>	6
3.1 Transmission time	6
3.2 Field strength of fundamental and spurious emission	9
3.3 20 dB bandwidth	12
<b>4. Test equipments list</b>	15
<b>Appendix 1 : Test Setup Photos</b>	
<b>Appendix 2 : FCC ID Label and location</b>	
<b>Appendix 3 : External Photos of EUT</b>	
<b>Appendix 4 : Internal Photos of EUT</b>	
<b>Appendix 5 : Block Diagram</b>	
<b>Appendix 6 : Schematics</b>	
<b>Appendix 7 : Circuit Description</b>	
<b>Appendix 8 : User's Manual</b>	

Remark: Above appendix 1 to 8 are not included in this report, but submitted to TCB (UL Korea) for FCC and IC certification.

## 1. General description of EUT

### 1.1 Applicant

- Company name : SEGI LIMITED
- Address : Room 1808, 18/F, Tower 2, Admiralty Center, 18 Harcourt Rd., Hongkong City, 186, China
- Contact person : Eui Seok, Chung
- Phone/Fax : +82-32-623-5550 / +82-32-623-6667

### 1.2 Manufacturer

- Company name : SEGI ELECTRONIC CO., LTD
- Address : Chenjiapucun, Liaobu Town, Dongguan City, Guandong Province, China
- Contact person : Eui Seok, Chung
- Phone / Fax : 82-32-623-5550 / 82-32-623-6667

### 1.3 Basic description of EUT

- Product name : Keyless Entry System
- Model name : FTX1400R-AM
- Serial number : Not available(Proto Type)
- Frequency : 433.92 MHz
- Channel number : 1 Channel
- Modulation method : ASK
- FCC Rule Part(s) : FCC CFR47 Part 15 Subpart C Section 15.231
- IC Rule Part(s) : IC RSS-210 Issue8 Annex I-2010
- FCC classification : DSC / Part 15 Security / Remote control Transmitter
- IC classification : Annex 1 / Momentarily Operated Devices and Remote Control
- Date of test : September 5, 2011 to September 23, 2011
- Date of issue : September 26, 2011
- Place of test : Head office

C-3601, Dongil Technotown, 889-1, Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea, 483-060

#### Open area test site

80, Jeil-ri, Yangji-myun, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-825

(FCC Registration Number : 337229)

(IC Submission Number : 143881)

(KCC Designation Number : KR0027)

#### 1.4 Technical specification of EUT

<b>Product Name</b>	Keyless Entry System
<b>Size(mm)</b>	67.50 (W) x 33.77 (L) x 15.65 (H)
<b>Battery Size</b>	CR2025 x 2
<b>Transmit Frequency</b>	433.92 MHz by pattern antenna
<b>Modulation Method</b>	ASK

## 2. General information of test

### 2.1 Applied standards for measurement

<b>Applied Standards: FCC CFR47 Part 15 Subpart C and IC RSS-210 Issue8 Annex I-2010</b>				
<b>FCC</b>	<b>IC</b>	<b>Description of Test</b>	<b>Limit</b>	<b>Result</b>
15.207	-	Conducted Emission (dB $\mu$ V/m)	Various	N/A[note 1]
15.231(a)	A1.1.1	Transmission Time (sec)	5	Pass
15.231(b)	A1.1.2	Field Strength of Fundamental (dB $\mu$ V/m)	100.82(Peak) / 80.82(AV)	Pass
15.231(b) & 15.209	A1.1.2	Radiated Emission (dB $\mu$ V/m)	80.82(Peak) / 60.82(AV)	Pass
15.231(c)	A1.1.3	Occupied Bandwidth (kHz)	1 084.8	Pass

Note1 : This equipment is battery operated.

### 2.2 Description of EUT modification

During the test, there was no mechanical or circuitry modification to improve RF and spurious characteristic, and any RF and spurious suppression device(s) was not added against the device tested.

### 2.3 Test configuration

- Type of peripheral equipment used

<b>Description</b>	<b>Model Name</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>FCC ID</b>
EUT	FTX1400R-AM	N/A	SEGI LIMITED	VA5JR500-1A433

- Type of cable used

<b>Device from</b>	<b>Device to</b>	<b>Type of Cable</b>	<b>Cable Number</b>	<b>Length</b>
-	-	-	-	-

### **3. Measurement data**

#### **3.1 Transmission time**

##### **3.1.1 Definitions**

A transmission time is a switching time that will automatically deactivate the transmission of transmitter of EUT.

##### **3.1.2 Specification**

- FCC Rules Part 15 Subpart C Section 15.231(a)(1)
- IC Rules RSS-210 Issue8 Annex I-2010 A1.1.1

##### **3.1.3 Measurement method**

The device output is connected to the spectrum analyzer.

##### **3.1.4 Set-Up**



##### **3.1.5 Test equipment list**

Equipment	Model Name	Manufacturer
EUT	FTX1400R-AM	SEGI LIMITED
Spectrum Analyzer	N9020A	Agilent

##### **3.1.6 Test procedure**

###### Spectrum analyzer setting:

- Center Frequency: 433.92 MHz
- Span : Zero
- RBW : 100 kHz
- VBW : 100 kHz
- Sweep time : 1 s
- Detect Mode : Peak

##### **3.1.7 Test condition**

- Test place : Shield room
- Test mode : Normal operation
- Test environment : 23 °C, 59 %R.H.

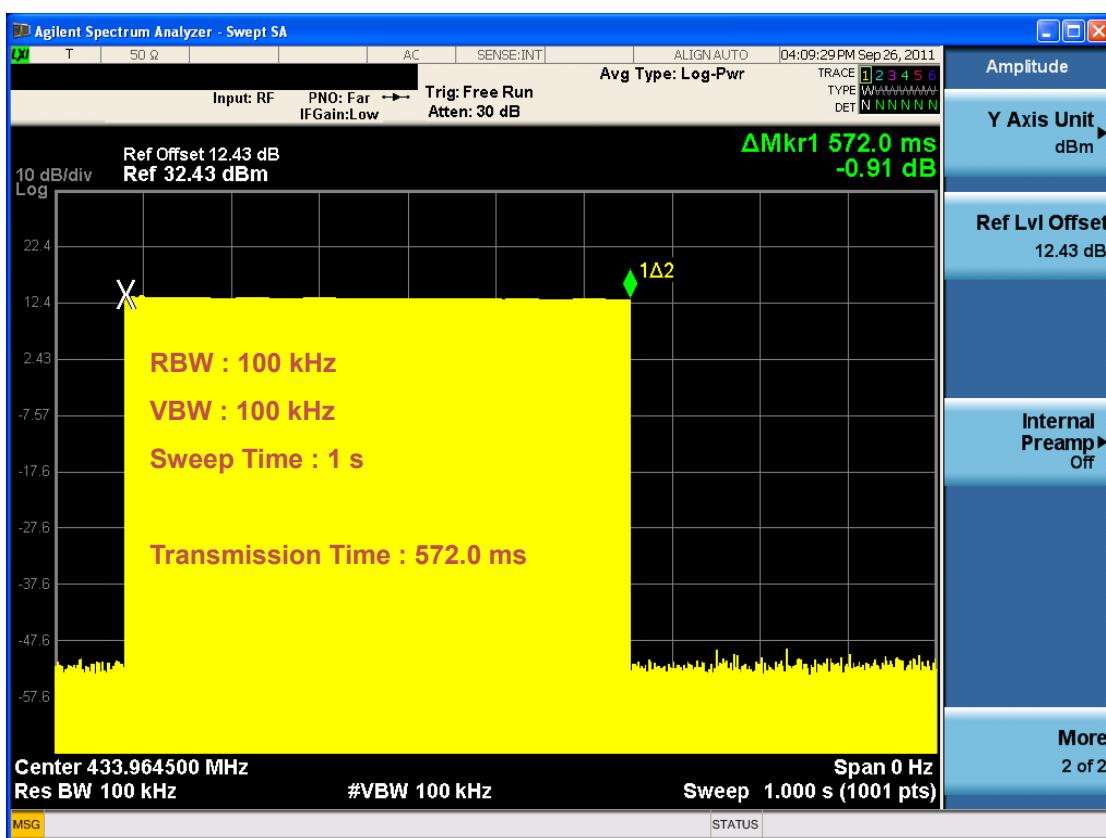
### 3.1.8 Test result

Frequency (MHz)	Transmission Time (s)	Limit (s)
433.92	0.572	5.000

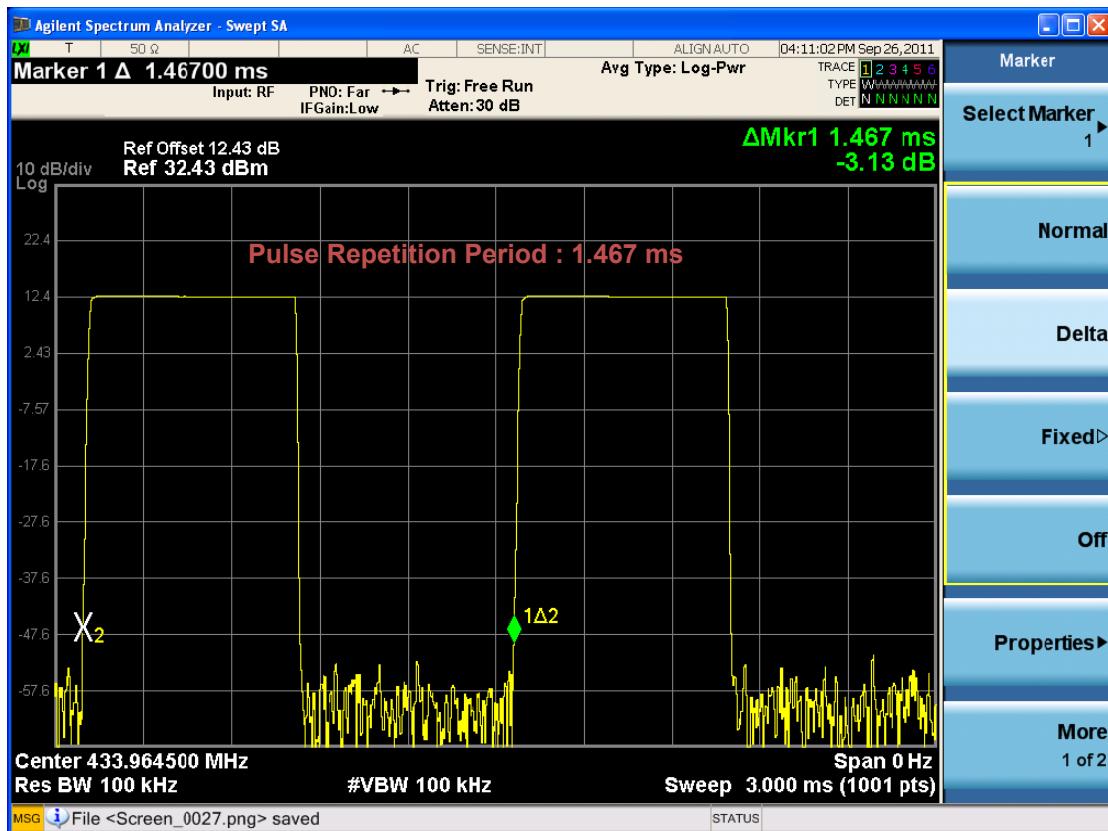
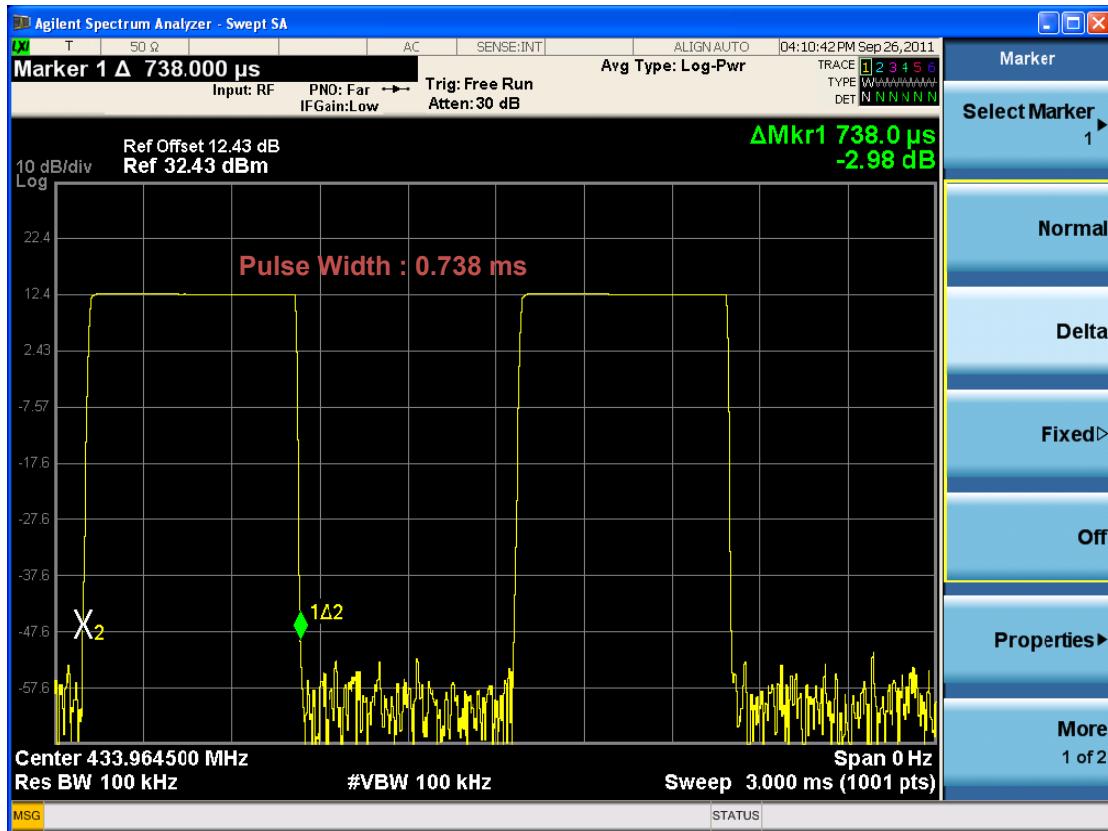
### 3.1.9 Limit

Less than 5 seconds.

### 3.1.10 Plot of transmission time (6 words)



### 3.1.11 Plots of data type



$$\text{Average Factor} = 20 \log \left[ \frac{0.738 \text{ ms}}{1.467 \text{ ms}} \right] \text{ dB} = -6.0 \text{ dB}$$

### 3.2 Field strength of fundamental and spurious emission

#### 3.2.1 Definitions

A field strength emission is a emission from the equipment when transmitting into a non-radiating load on fundamental frequency and frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

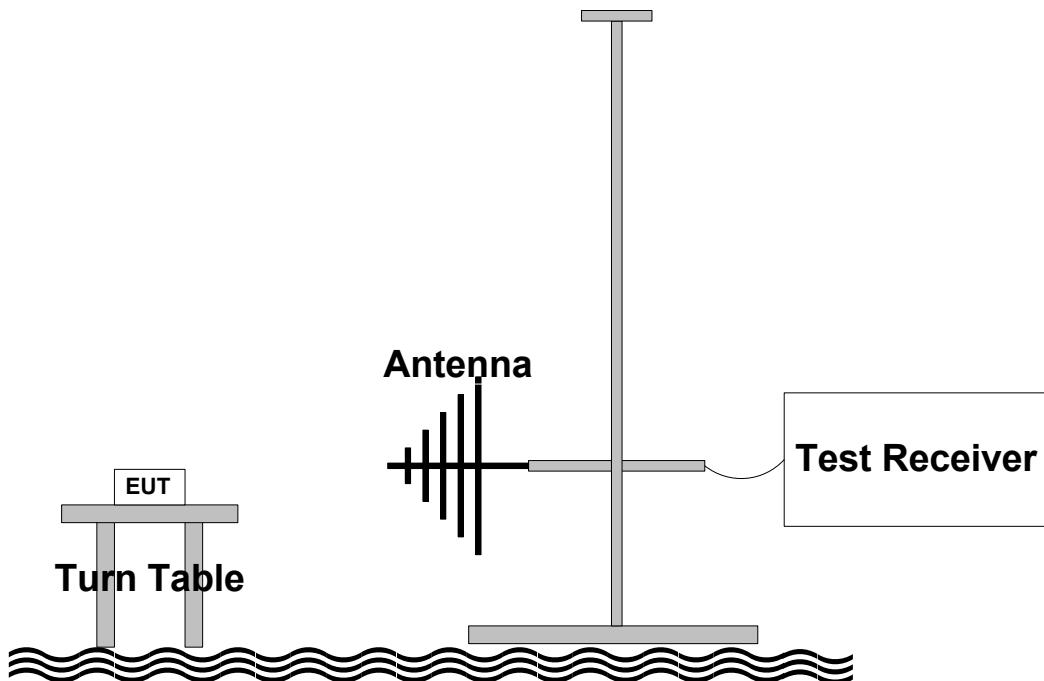
#### 3.2.2 Specification

- FCC Rules Part 15 Subpart C Section 15.231(b)
- IC Rules RSS-210 Issue8 Annex I-2010 A1.1.2

#### 3.2.3 Measurement method

ANSI Standard C63.4-2009 8.3

#### 3.2.4 Set-Up



#### 3.2.5 Test equipment list

Equipment	Model Name	Manufacturer
EUT	FTX1400R-AM	SEGI LIMITED
Spectrum Analyzer	N9020A	Agilent
Loop Antenna	EMCO 6502	EMCO
Bi-conical Antenna	VHA9103	Schwarzbeck
Log Periodic Antenna	VULP9118A	Schwarzbeck
Horn Antenna	BBHA-9120D	Schwarzbeck
Pre-Amplifier	JS4-00102600-26-5P	MITEQ

### 3.2.6 Test procedure

The EUT is placed on a turntable, which is 0.8 meter high above ground.

The turntable rotates 360 degrees to determine the position of the maximum emission level.

EUT is set 3.0 meters away from the receiving antenna, broadband antenna, which is mounted on an antenna mast.

The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level form the EUT. Both horizontal and vertical polarizations of the antenna are set on measurement.

In order to find out the maximum emission levels, all of the EUT location were manipulated according to ANSI 63.4 during the radiated emission measurement.

The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 120 kHz between 30 to 1 000 MHz, and 1 MHz between 1 to 5 GHz.

### 3.2.7 Test condition

- Test place : Open area test site
- Test mode : Normal operation
- Test environment : 21 °C, 52 % R.H.

### 3.2.8 Test result

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/QP/AVG]	Reading [dB $\mu$ V]	Antenna Factor [dB/m]	Cable Loss [dB]	AVG Factor [dB]	Pre-Amp Gain [dB]	Emission Level [dB $\mu$ V]	Limit [dB $\mu$ V]	Margin [dB]
433.92	V	Peak	89.2	15.9	4.5	0	40.5	69.1	100.8	31.7
		**AVG				-6.0		63.1	80.8	17.7
867.84	V	Peak	51.2	22.4	9.0	0	40.5	42.1	80.8	38.7
		**AVG				-6.0		36.1	60.8	24.7
*1301.76	H	Peak	46.7	24.3	13.6	0	27.1	57.5	74.0	16.5
		**AVG				-6.0		51.5	54.0	2.5
1735.68	H	Peak	43.0	24.8	18.1	0	27.1	58.8	80.8	22.0
		**AVG				-6.0		52.8	60.8	8.0
2169.60	H	Peak	37.1	25.4	22.6	0	27.1	58.0	80.8	22.8
		**AVG				-6.0		52.0	60.8	8.8
2603.52	H	Peak	12.3	27.9	27.1	0	27.1	40.2	80.8	40.6
		**AVG				-6.0		34.2	60.8	26.6
3037.44	H	Peak	18.2	28.4	31.6	0	27.1	51.1	80.8	29.7
		**AVG				-6.0		45.1	60.8	15.7
3471.36	H	Peak	8.2	29.1	36.1	0	27.1	46.3	80.8	34.5
		**AVG				-6.0		40.3	60.8	20.5
*3905.28	H	Peak	0.0	29.7	40.7	0	27.1	43.3	74.0	30.7
		**AVG				-6.0		37.3	54.0	16.7
*4339.20	H	Peak	-0.3	30.3	45.2	0	27.1	48.2	74.0	25.9
		**AVG				-6.0		42.2	54.0	11.9

Here, \* is restricted frequency, \*\* is the average value applied with average factor.

This measurement value is tested at "X" plane, because worst case.

### 3.2.9 Limit

- Fundamental

Fundamental Frequency (MHz)	Field Strength of Fundamental ( $\mu\text{V/m}$ )	Field Strength of Fundamental ( $\text{dB}\mu\text{V/m}$ )
40.66 – 40.70	2 250	67.04
70 – 130	1 250	61.94
130 – 174	1 250 to 3 750	61.94 to 71.48
174 – 260	3 750	71.48
260 – 470	3 750 to 12 500	71.48 to 81.94
Above 470	12 500	81.94

- Spurious emission

Fundamental Frequency (MHz)	Field Strength of Spurious Emission ( $\mu\text{V/m}$ )	Field Strength of Spurious Emission ( $\text{dB}\mu\text{V/m}$ )
40.66 – 40.70	225	47.04
70 – 130	125	41.94
130 – 174	125 to 375	41.94 to 51.48
174 – 260	375	51.48
260 – 470	375 to 1 250	51.48 to 61.94
Above 470	1 250	61.94

- Spurious emission at restricted band

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ )	Field Strength ( $\text{dB}\mu\text{V/m}$ )	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	48.52 to 13.80	300
0.490 – 1.705	24000/F(kHz)	33.80 to 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40.00	3
88 – 216	150	43.52	3
216 – 960	200	46.02	3
Above 470	500	53.98	3

Here, Restricted band are 1 301 to 1 427 MHz and 3 600 to 4 400

### 3.3 20 dB Bandwidth

#### 3.3.1 Definitions

A 20 dB Bandwidth is width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each lower 20 dB of the total mean power of a given emission.

#### 3.3.2 Specification

FCC Rules Part 15, Subpart C, Section 15.231(c)

#### 3.3.3 Measurement methods

ANSI Standard C63.4-2009 10.1.8.8

#### 3.3.4 Set-Up



#### 3.3.5 Test equipment list

Equipment	Model Name	Manufacture
EUT	FTX1400R-AM	SEGI LIMITED
Spectrum Analyzer	N9020A	Agilent

#### 3.3.6 Test procedure

##### Spectrum Analyzer setting

- Center Frequency : 433.92 MHz
- Span : 0.5 MHz / 1 MHz
- RBW : 9 kHz / 30 kHz / 120 kHz
- VBW : 30 kHz / 100 kHz / 300 kHz
- Detect Mode : Peak

#### 3.3.7 Test condition

- Test Place : Shield Room
- Test Mode : Normal Operation
- Test Environment : 23 °C, 59 %R.H.

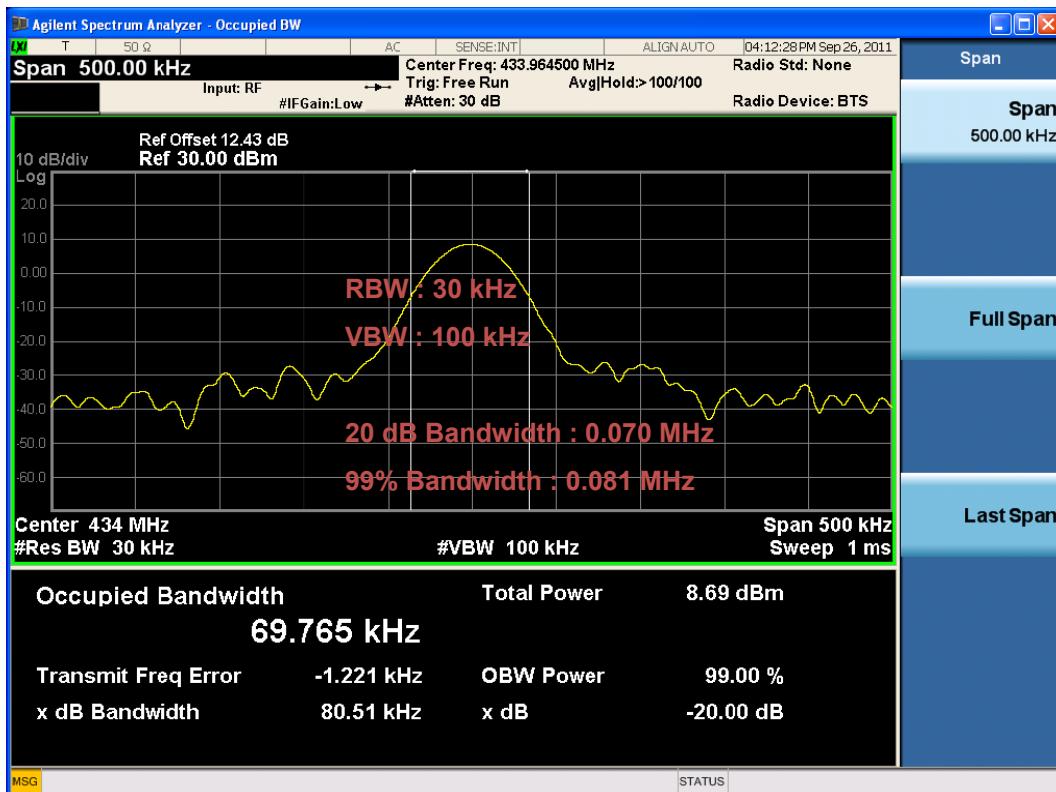
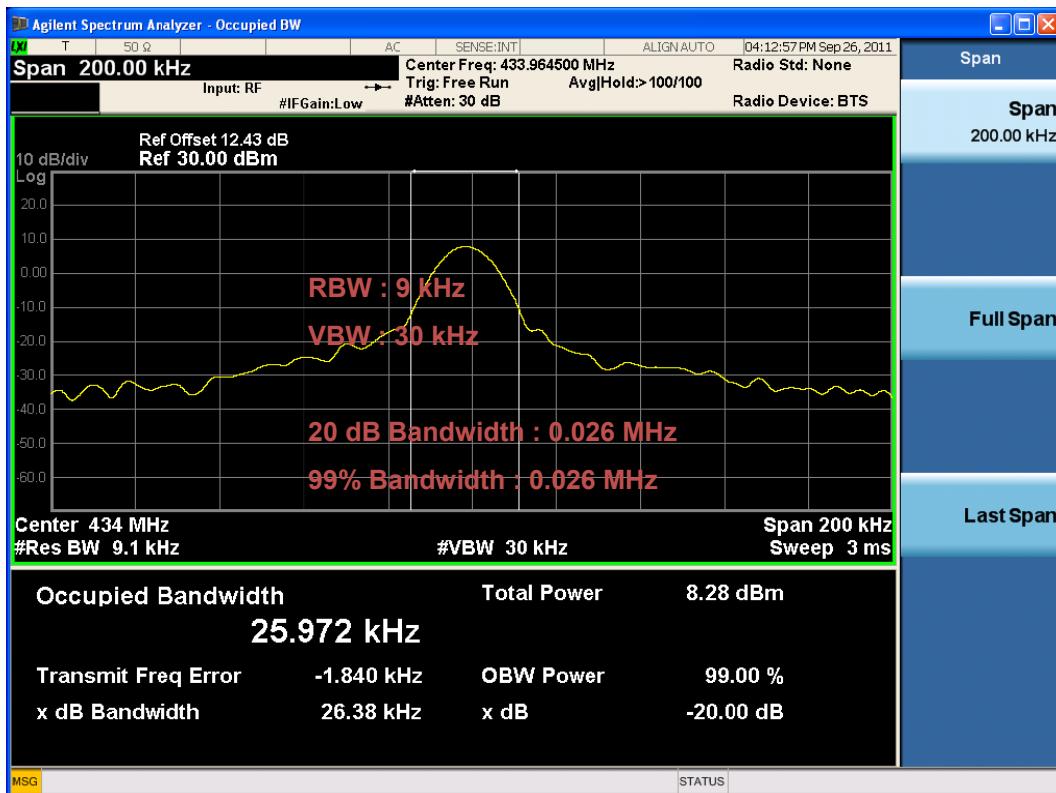
#### 3.3.8 Test result

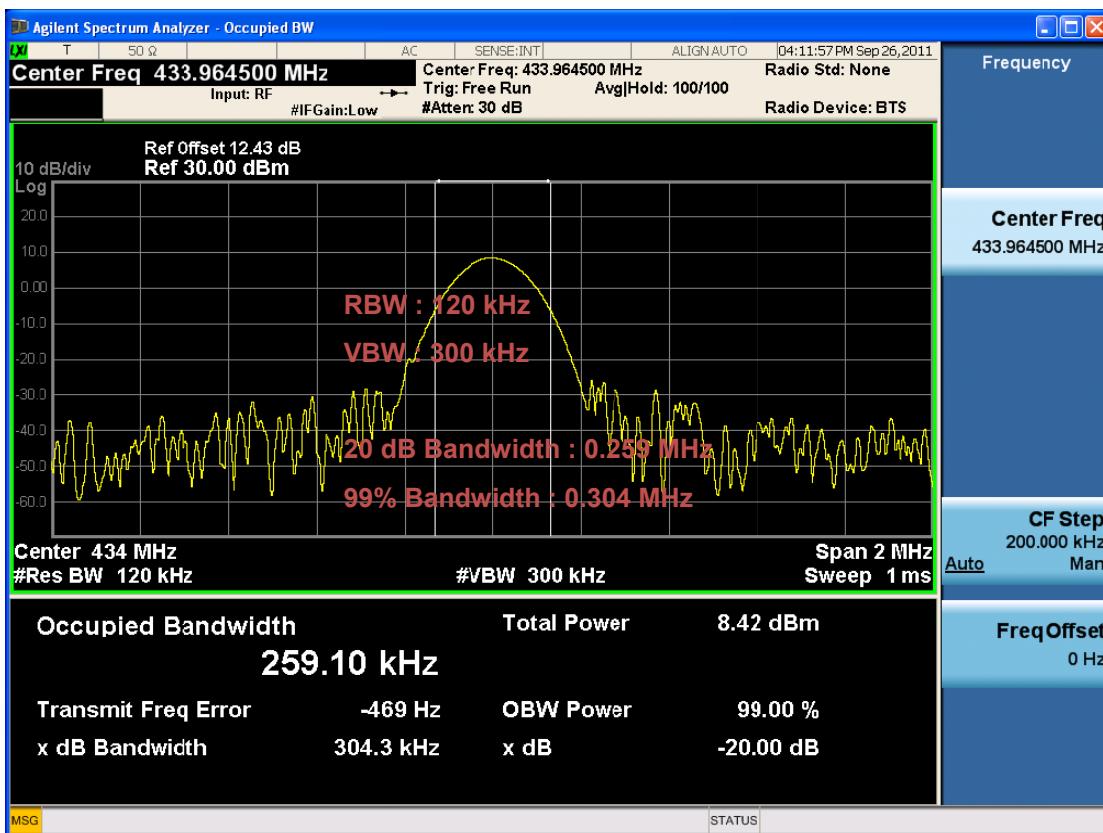
Frequency (MHz)	RBW (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)
433.92	9 kHz	0.026	0.026	1.085
	30 kHz	0.070	0.081	
	120 kHz	0.256	0.304	

### 3.3.9 Limit

Less than 0.25 % (1.085 MHz).

### 3.3.10 Plots of 20 dB bandwidth and 99% Bandwidth





### **Annex. Technical Brief for Exemption from RF exposure evaluation**

The RSS-102 clause 2.5.2 specifies the exemption from routine RF Exposure evaluation.

The RF exposure is not required if the radio device meet the following condition.

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

For the technical brief of the exemption of this device, the following calculation was applied.

1. The EIRP limit of 2.5 W is presumes Homogenous far field condition of  $E/H = 120 \times \pi$
2. 121.6 dBuV/m field strength at 3 m distance.

Electrical field limit  $E$  (V/m) = 1.2022644.

Power density of isotropic antenna

$$S = \frac{E^2}{120\pi} \quad \text{and} \quad S = \frac{p}{4\pi d^2}$$

Equivalent isotropically radiated power EIRP (dBm)

$$\text{EIRP} = 10 \log\left(\frac{4\pi d^2 S}{10^{-3}}\right)$$

Calculation of EIRP=26.37dBm or 0.434 W

Effective radiated power ERP = EIRP-2.15 = 24.22 dBm or 0.264 W

The calculation show that the EIRP of any emission from the radio device less than emission limit of 121 dBuV/m always below the compliance power limit of 2.5 W which can be exempted the RF exposure evaluation.

#### 4. Test equipments list

The listing below denotes the test equipments for the test(s).

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Due date
1	Spectrum Analyzer	N9020A	Agilent	MY48010456	03/10/12
2	Power Supply	E3633A	Agilent	SG400022272	10/02/11
3	Loop Antenna	6502	EMCO	9609-9087	03/03/12
4	Biconical Antenna	BBAK9137	Schwarzbeck	2217	02/23/12
5	Log-Periodic Antenna	VULP9118A	Schwarzbeck	382	02/23/12
6	Horn Antenna	BBHA 9120 D	Schwarzbeck	395	08/13/12
7	Pre-Amplifier	JS4-00102600-26-5	Miteq	383521	03/10/12
8	Turn Table	N/A	Daeil EMC	N/A	N/A
9	Antenna Mast	EAM4.5	Daeil EMC	N/A	N/A
10	Controller	DE200	Daeil EMC	AAA69813111	N/A