


# TEST REPORT

Report Number		RAPA12-O-414
Type of Equipment		Keyless Entry System
Model Name		ANT-2WSP
FCC ID		VA5A1000-2WSP
IC Number		7087A-2WA1000SP
Applicant	Name	SEGI LIMITED
	Logo	
	Address	Room 1808, 18/F, Tower 2, Admiralty Centre, 18 Harcourt Rd., Admiralty, Hong Kong
Manufacturer	Name	SEGI ELECTRONICS CO., LTD.
	Address	Chenjiapucun, Liaobu Town, Dongguan City, Guangdong Province, P.R.China
Date of reception		June 13, 2012
Date of test		June 18, 2012 to July 2, 2012
Date of issue		July 3, 2012
Total Page		19 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 1-2010.


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 : July 3, 2012



Tested by Chang Young Choi  
Deputy General Manager

Date : July 3, 2012



Reviewed by Sukil Park  
Executive Managing Director

## CONTENTS

<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 Standard for measurement methods.....	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.....	14
3.3 20 dB Bandwidth.....	17
<b>4. Test equipment list</b> .....	19

## 1. General description of EUT

### 1.1 Applicant

- Company name : SEGI LIMITED
- Address : Room 1808, 18/F, Tower II, Admiralty Centre, 18 Harcourt Rd., Admiralty, Hong Kong
- Contact person : Eui Seok, Chung
- Phone/Fax : 82-32-623-5550 / 82-32-623-6667

### 1.2 Manufacturer

- Company name : SEGI ELECTRONICS CO., LTD
- Address : Chenjiapucun, Liaobu Town, Dongguan City, Guangdong Province, P.R.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 : ANT-2WSP
- Serial number : Not available(Proto Type)
- Frequency : 433.92 MHz(Tx)
- 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 1-2010
- FCC classification : DSC / Part 15 Security/Remote control Transmitter
- IC classification : Annex 1 / Momentarily Operated Devices and Remote Control
- Date of test : June 18, 2012 to July 2, 2012
- Date of issue : July 3, 2012
- Place of test : Head office

824, B104, Anyang Megavalley, 799, 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>Model Name</b>	ANT-2WSP
<b>Product Name</b>	Keyless Entry System
<b>Size(mm)</b>	32.4 x 77.0 x 14.8 (W x L x H)
<b>Battery Size</b>	12 Vdc
<b>Transmit Frequency</b>	433.92 MHz
<b>Modulation Method</b>	ASK

## 2. General information of test

### 2.1 Standard for measurement methods

Applied Standard : FCC CFR47 Part 15 Subpart C, IC RSS-210 Issue8 Annex 1-2010				
FCC	IC	Description of Test	Limit	Result
15.231(a)	A1.1.1	Transmission Time(s)	5	Pass
15.231(b)	A1.1.2	Field Strength of Fundamental (dB $\mu$ V/m)	100.8(Peak) / 80.8(AVG)	Pass
15.231(b) & 15.209	A1.1.2	Radiated Emission(dB $\mu$ V/m)	80.8(Peak) / 60.8(AVG)	Pass
15.231(c)	A1.1.3	Occupied Bandwidth(kHz)	1084.8 kHz	Pass

### 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

Description	Model Name	Serial No.	Manufacturer	FCC ID	IC Number
EUT	ANT-2WSP	N/A	SEGI Electronics Co., Ltd.	VA5A1000-2WSP	7087A-2WA1000SP

#### • Type of cable used

Device from	Device to	Type of Cable	Cable Number	Length
-	-	-	-	-

### 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 1-2010 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	ANT-2WSP	SEGI Electronics Co., Ltd.
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: 26 °C, 49 % R.H.

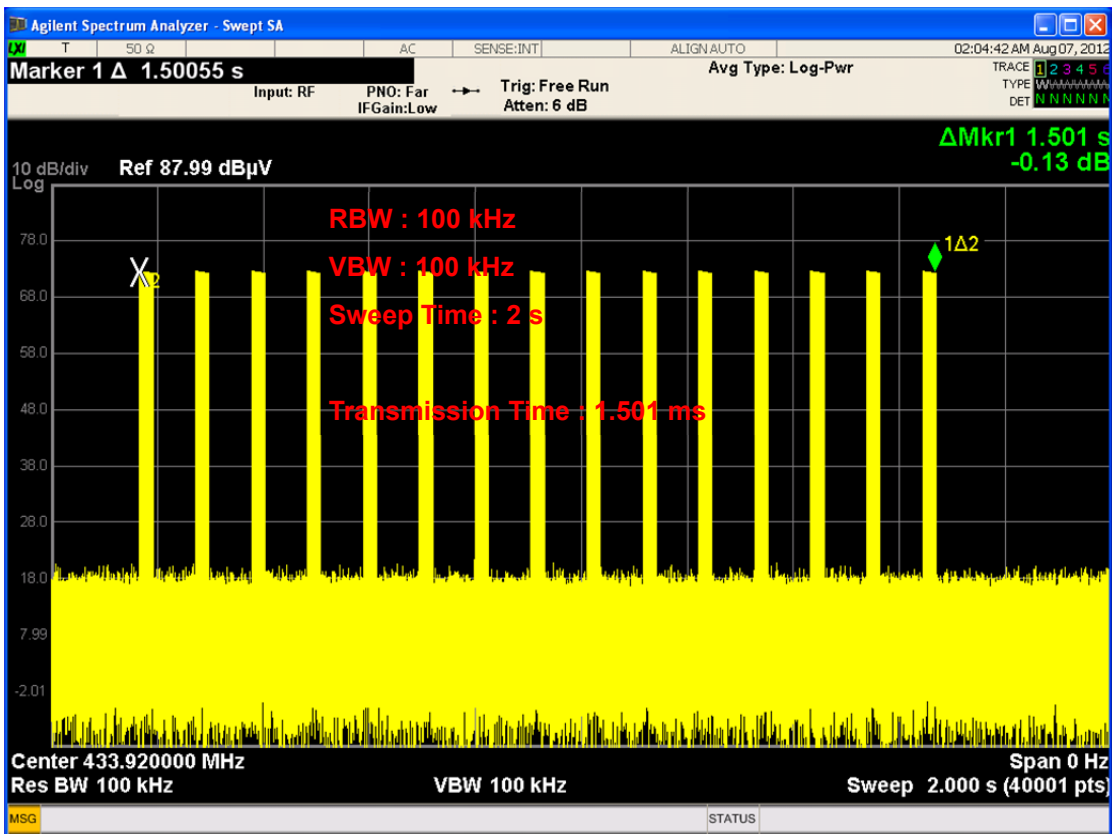
**3.1.8 Test result**

Frequency (MHz)	Transmission Time (s)	Limit (s)
433.92	1.501	5.00

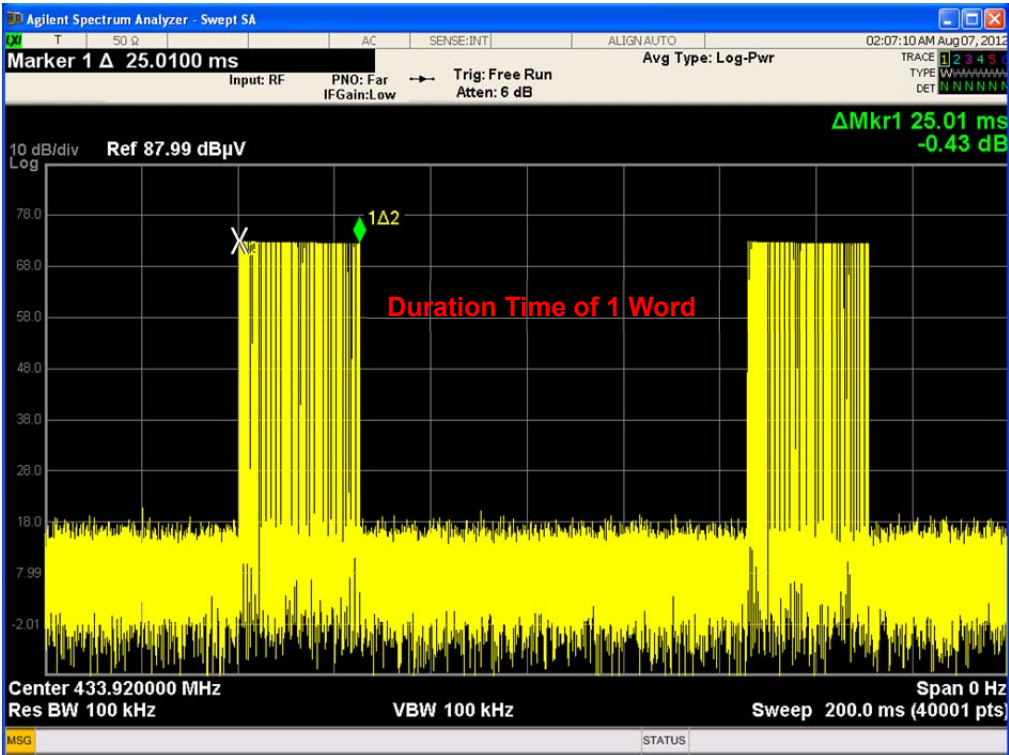
**3.1.9 Limit**

Less than 5 seconds.

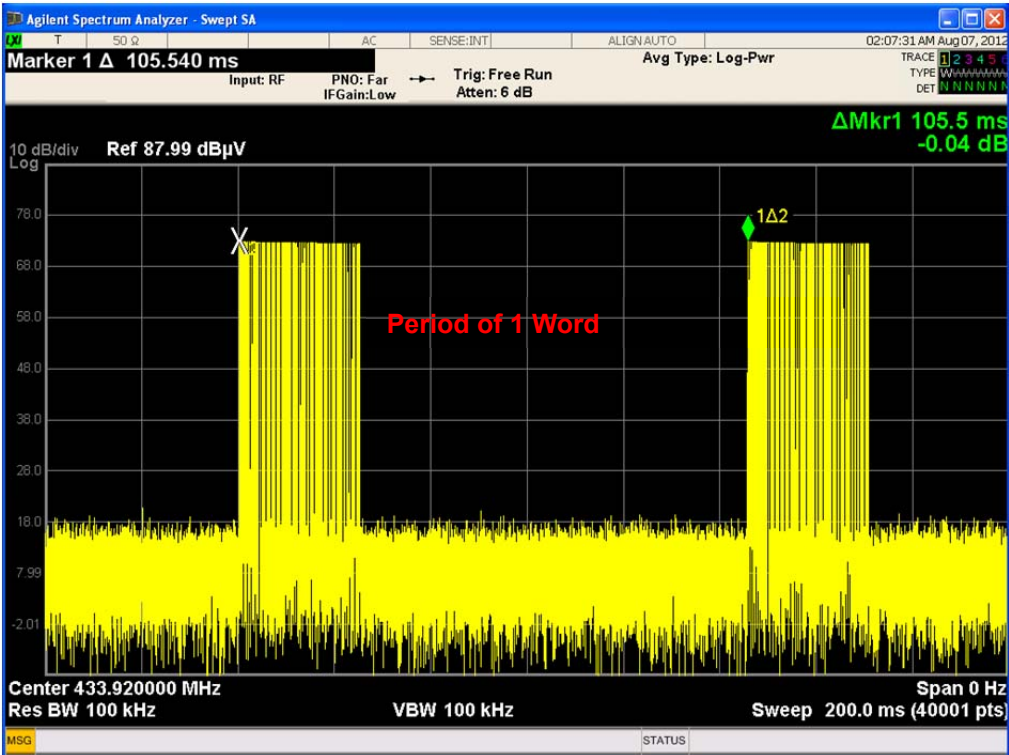
**3.1.10 Plots of transmission time (15 words)**



**3.1.11 Plot of 1 word**



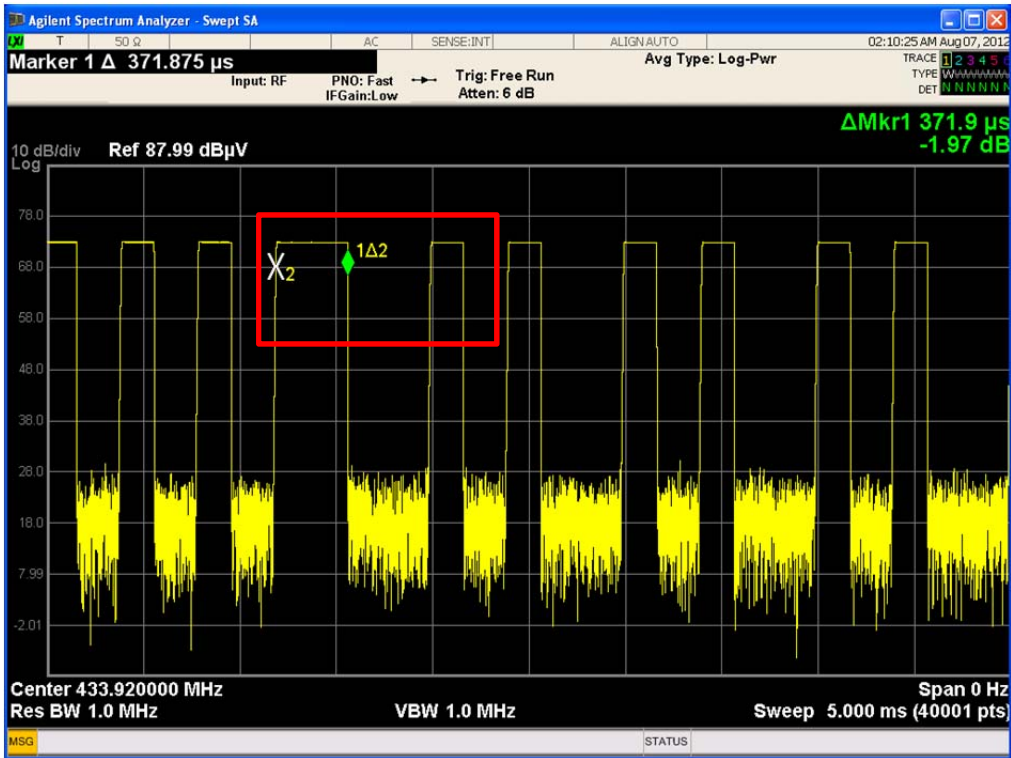
**Duration Time of 1 word : 25.01 ms**



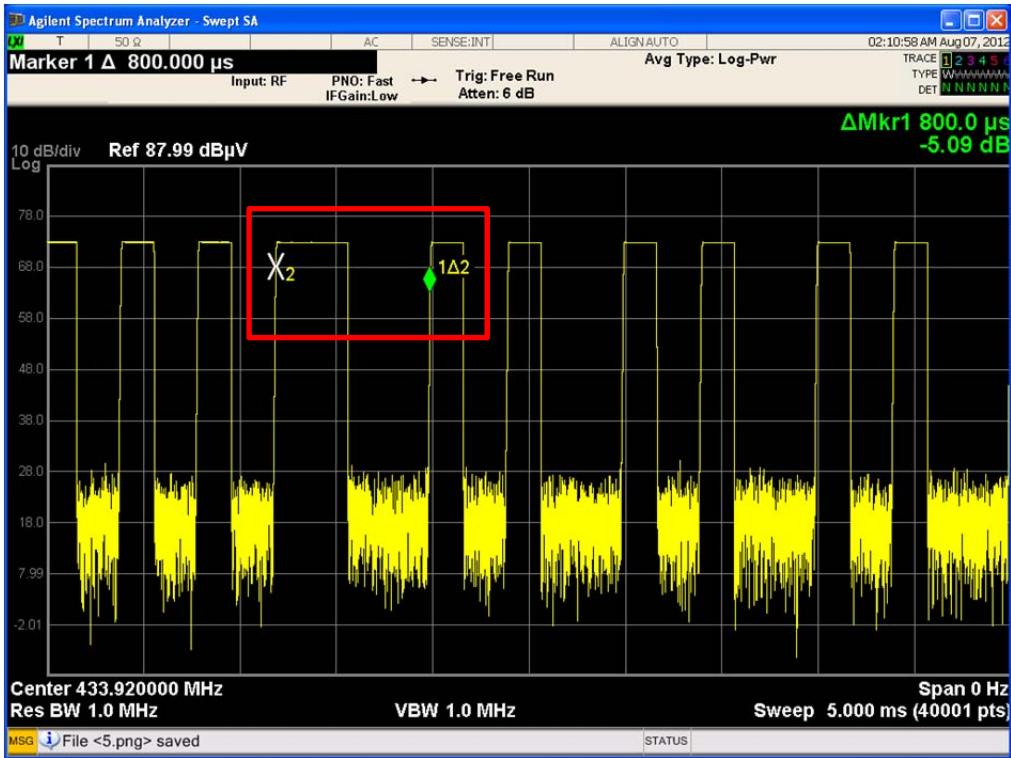
**Period of 1 word : 105.5 ms**



**3.1.12 Plot of Data Format Type 1 (1<sup>st</sup> Data of SYNC)**

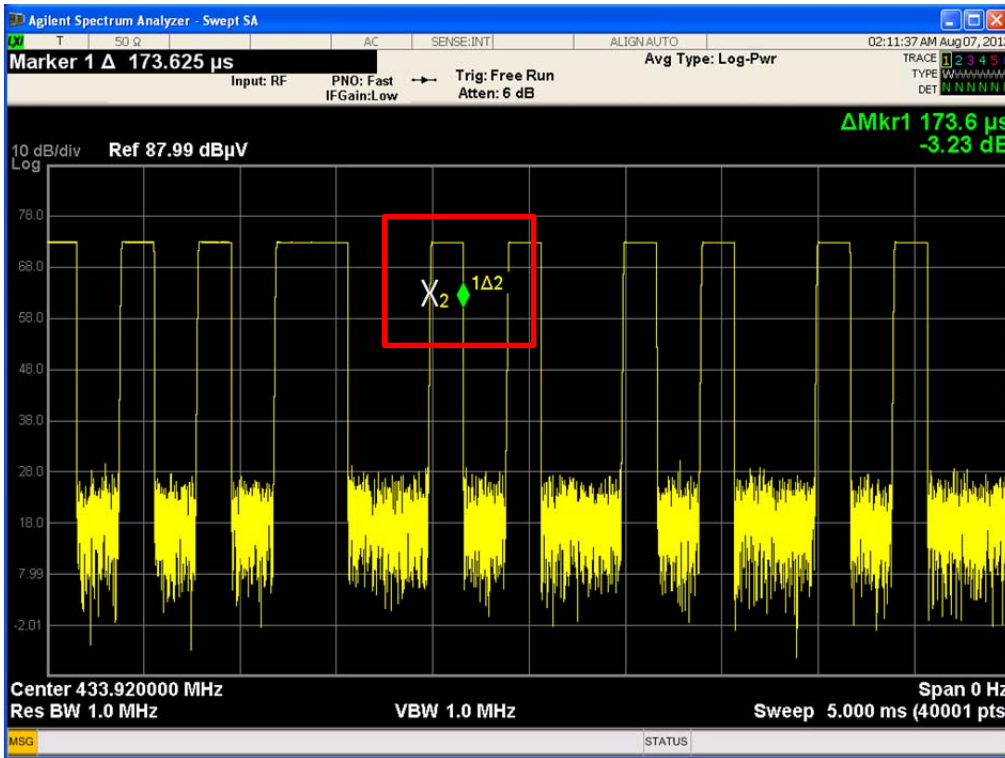


**Duration Time of Type 1 (1<sup>st</sup> Data) : 371.9 μs**



**Period of Type 1 (1<sup>st</sup> Data) : 800.0 μs**

**3.1.13 Plot of Data Format Type 1 (2<sup>nd</sup> Data of SYNC)**

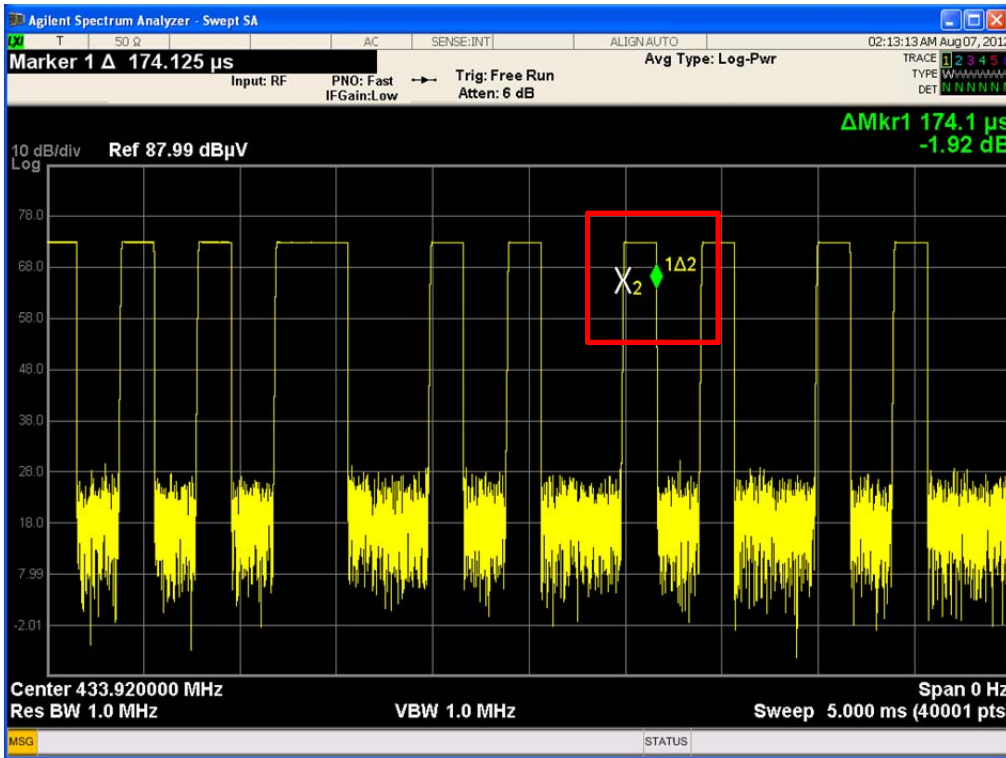


**Duration Time of Type 1 (2<sup>nd</sup> Data) : 173.6 μs**



**Period of Type 1 (2<sup>nd</sup> Data) : 402.0 μs**

**3.1.14 Plot of Data Format Type 2 (Bit 0)**

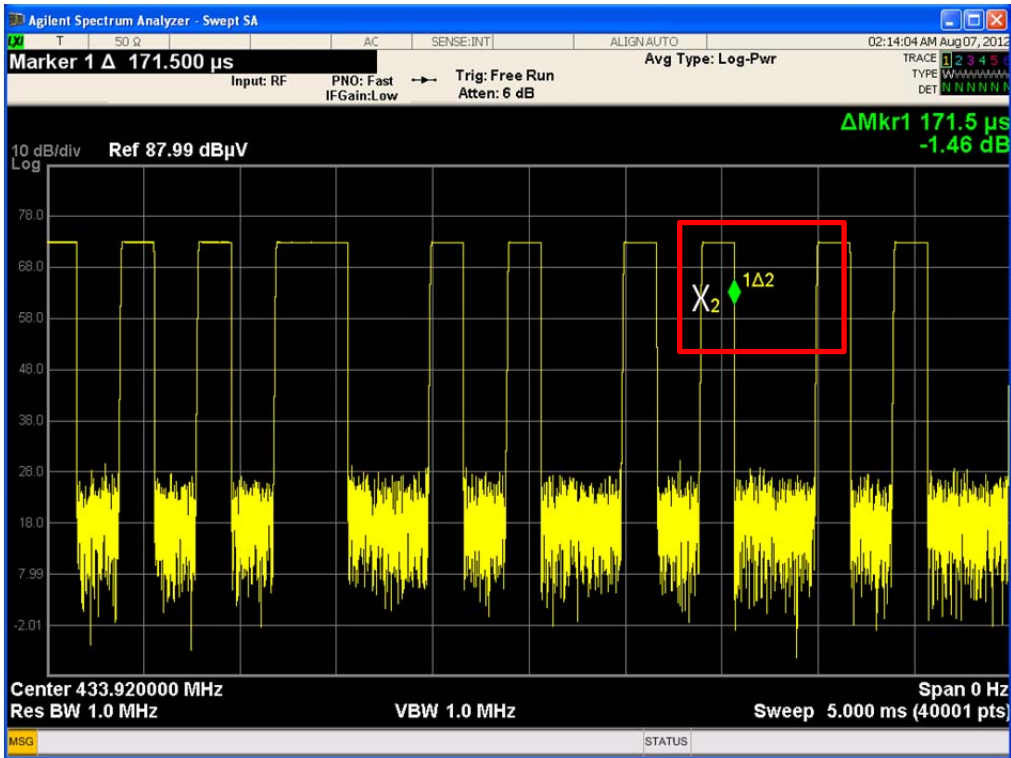


**Duration Time of Type 2 (Bit 0) : 174.1 μs**

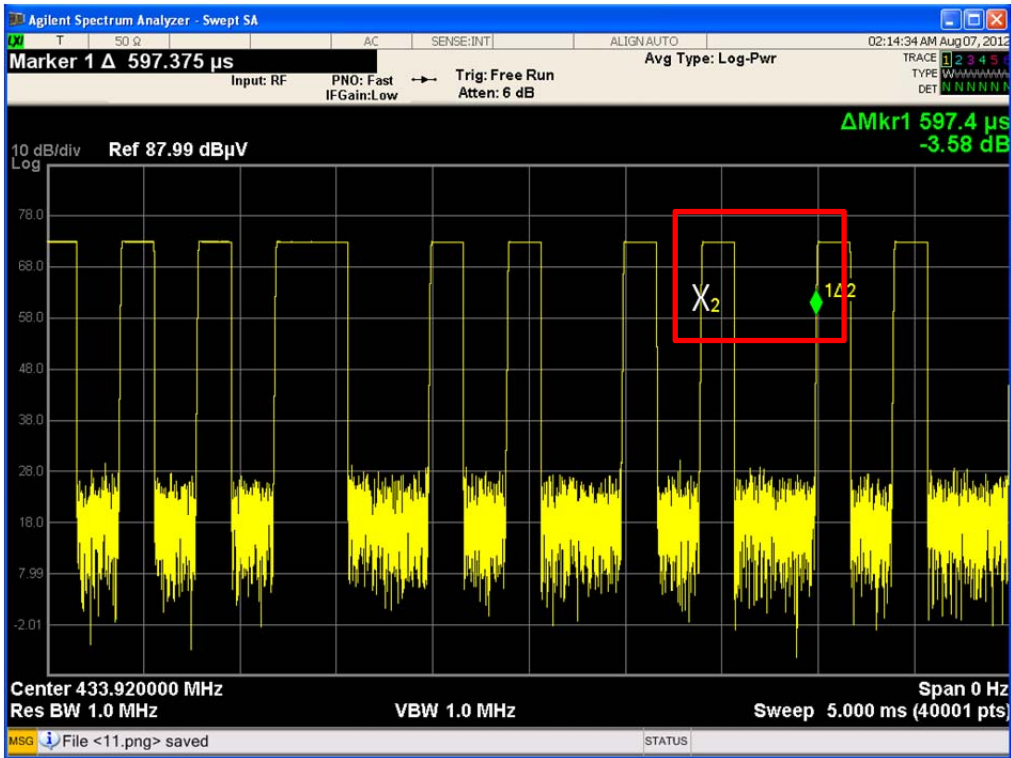


**Period of Type 2 (Bit 0) : 403.8 μs**

**3.1.15 Plot of Data Format Type 3 (Bit 1)**

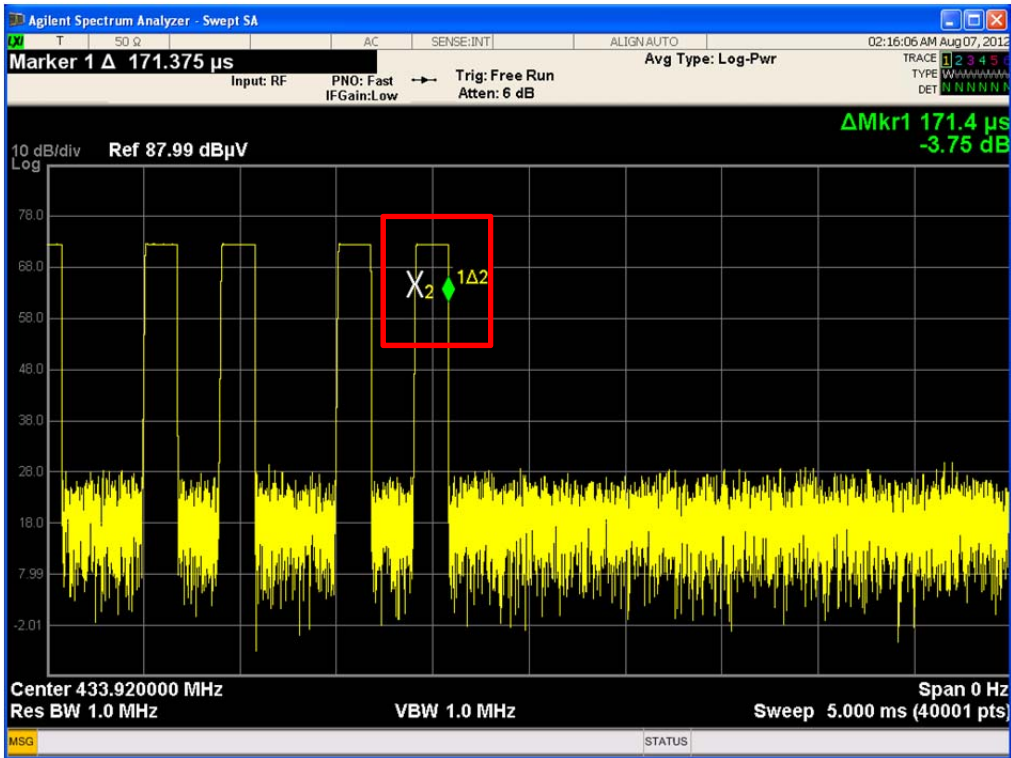


**Duration Time of Type 3 (Bit 1) : 160.5 μs**



**Period of Type 3 (Bit 1) : 597.4 μs**

**3.1.16 Plot of Data Format Type 4 (END)**



**Duration Time of Type 4 (Bit 0) : 171.4 μs**

**3.1.17 Data Format of 1 Word**

Data Type	Format	Duration Time (μs)	
Dummy Data	(Bit 0) x 6	174.1 x 6	1044.6
SYNC	(SYNC) x 1	371.9 + 173.6	545.5
Data	(Bit 0 or Bit 1) x 32	174.1 x 32	5571.2
CRC	(Bit 0 or Bit 1) x 8	174.1 x 8	1392.8
END	(END) x 1	171.4 x 1	171.4

**3.1.18 Average Factor**

$$\text{Total Average Factor} = 20 \log \left[ \frac{(1044.6 + 545.5 + 5571.2 + 1392.8 + 174.1)}{100000} \right] \text{ dB}$$

$$= -21.2 \text{ dB}$$

### 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.

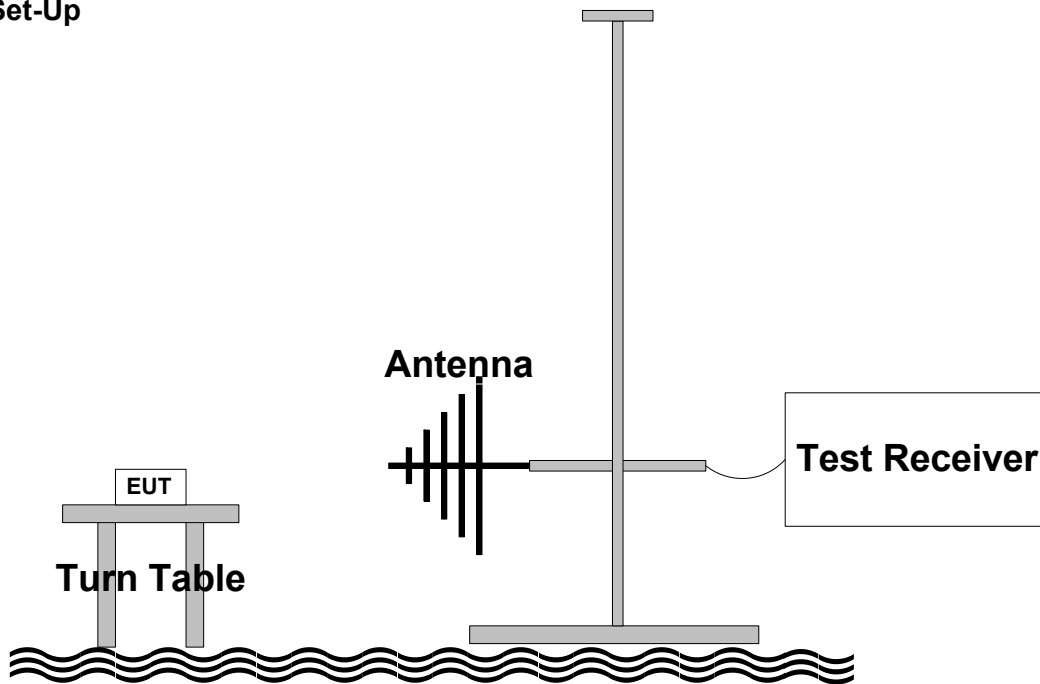
#### 3.2.2 Specification

FCC Rules Part 15 Subpart C Section 15.231(b)  
 IC Rules RSS-210 Issue8 Annex 1-2010 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	ANT-2WSP	SEGI Electronics Co., Ltd.
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	SCU-01	R&S
Pre-Amplifier	ESMI-Z7	R&S

### 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 from 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 1000 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

Freq. [MHz]	Pol. [H/V]	plane [X/Y/Z]	Detect Mode [Peak/QP/AVG]	Reading [dBµV]	ANT. Factor [dB/m]	Cable Loss [dB]	AVG Factor [dB]	Pre-Amp Gain [dB]	Emission Level [dBµV]	Limit [dBµV]	Margin [dB]
433.92	V	Y	Peak	119.2	15.9	4.5	0	40.5	99.1	100.8	1.7
			**AVG				-21.2		77.4	80.8	2.9
867.84	V	Y	Peak	57.8	22.4	9.0	0	40.5	48.7	80.8	32.1
			**AVG				-21.2		27.5	60.8	33.3
*1301.76	V	Y	Peak	20.0	24.3	13.6	0	16.8	41.1	74.0	32.9
			**AVG				-21.2		19.9	54.0	34.1
1735.68	-	-	Peak	-	24.8	18.1	0	16.6	-	80.8	-
			**AVG				-21.2		-	60.8	-
2169.60	-	-	Peak	-	25.4	22.6	0	16.4	-	80.8	-
			**AVG				-21.2		-	60.8	-
2603.52	-	-	Peak	-	27.9	27.1	0	16.1	-	80.8	-
			**AVG				-21.2		-	60.8	-
3037.44	-	-	Peak	-	28.4	31.6	0	16.2	-	80.8	-
			**AVG				-21.2		-	60.8	-
3471.36	-	-	Peak	-	29.1	36.1	0	15.8	-	80.8	-
			**AVG				-21.2		-	60.8	-
*3905.28	-	-	Peak	-	29.7	40.7	0	16.0	-	74.0	-
			**AVG				-21.2		-	54.0	-
*4339.20	-	-	Peak	-	30.3	45.2	0	15.8	-	74.0	-
			**AVG				-21.2		-	54.0	-

Here, \* is restricted frequency,

\*\* is the average value applied with average factor.

“-” is no emission data detected above noise floor.

### 3.2.9 Limit

- Fundamental

Fundamental Frequency (MHz)	Field Strength of Fundamental ( $\mu\text{V/m}$ )	Field Strength of Fundamental (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 (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 (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 bands are 1301 to 1427 MHz and 3600 to 4400 MHz.



### 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	Manufacturer
EUT	ANT-2WSP	SEGI Electronics Co., Ltd.
Spectrum Analyzer	N9020A	Agilent

#### 3.3.6 Test procedure

##### Spectrum Analyzer setting

- Center Frequency: 433.92 MHz
- Span: 1 MHz
- RBW: 30 kHz
- VBW: 100 kHz
- Detect Mode: Peak, Max Hold

#### 3.3.7 Test condition

- Test Place: Shield Room
- Test Mode: Normal Operation
- Test environment: 26 °C, 49 % R.H.

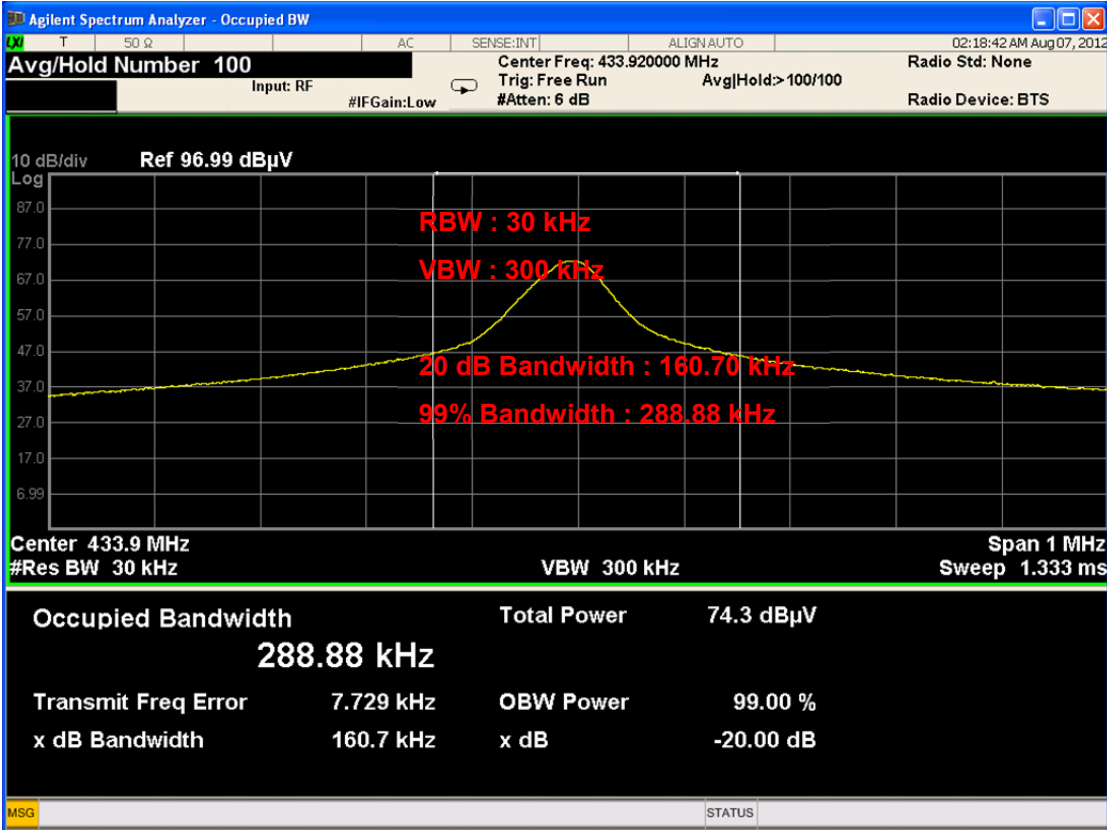
#### 3.3.8 Test result

Frequency (MHz)	RBW (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)
433.92	30 kHz	0.161	0.289	1.085

#### 3.3.9 Limit

Less than 0.25 % (1.085 MHz).

**3.3.10 Plots of 20 dB bandwidth and 99% bandwidth**



#### 4. Test equipment list

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

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Due date
1	Spectrum Analyzer	N9020A	Agilent	MY48010456	03/10/13
2	Biconical Antenna	BBAK9137	Schwarzbeck	2217	11/29/12
3	Log-Periodic Antenna	VULP9118A	Schwarzbeck	382	11/29/12
4	Horn Antenna	BBHA 9120 D	Schwarzbeck	395	08/13/12
5	Pre-Amplifier	SCU-01	R&S	383521	09/28/12
6	Pre-Amplifier	ESMI-Z7	R&S	N/A	12/29/12
7	Turn Table	N/A	Daeil EMC	N/A	N/A
8	Antenna Mast	EAM4.5	Daeil EMC	N/A	N/A
9	Controller	DE200	Daeil EMC	AAA69813111	N/A