

# TEST REPORT

of

FCC Part 15 Subpart C §15.231  
FCC ID: SV3-HMTX

Equipment Under Test : TX ASSY-KEYLESS ENTRY  
Model Name : HM-TX  
Serial No. : N/A  
Applicant : DAESUNG ELECTRIC CO., LTD.  
Manufacturer : Qingdao DAESUNG ELECTRIC CO., LTD.  
Date of Test(s) : 2007-07-20 ~ 2007-08-06  
Date of Issue : 2007-08-23

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date

2007-08-23

Feel Jeong

Approved By



Date

2007-08-23

Denny Ham

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**Appendix A. Photo of Field Strength fundamental & Spurious Emission Test****Appendix B. Photos of the EUT**

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## 1. General Information

### 1.1. Testing Laboratory

SGS Testing Korea Co., Ltd.

Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

[www.electrolab.kr.sgs.com](http://www.electrolab.kr.sgs.com)

Telephone : +82 31 428 5700

FAX : +82 31 427 2371

### 1.2. Details of Applicant

Applicant : DAESUNG ELECTRIC CO.,LTD.  
Address : 8-27B/L, 743-5, Wonsi-dong Danwon-gu, Ansan-si, gyeong-do,425-090 Korea  
Contact Person : Eui-Wan Jeong  
Phone No. : 82-31-494-1141  
Fax No. : 82-31-495-1734

### 1.3. Description of EUT

<b>Kind of Product</b>	TX ASSY-KEYLESS ENTRY
<b>Model Name</b>	HM-TX
<b>Serial Number</b>	N/A
<b>Power Supply</b>	DC 3 V(Lithium)
<b>Frequency Range</b>	315 MHz
<b>Modulation Technique</b>	FSK
<b>Frequency Generation</b>	X-tal
<b>Number of Channels</b>	1
<b>Operating Conditions</b>	-20°C ~ +60°C
<b>Antenna Type</b>	Integrated PCB Pattern

### 1.4. Details of Modification

-N/A

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### 1.5. Test Equipment List

EQUIPMENT	MANUFACTURER	MODEL	CAL DUE.
Signal Generator	Agilent	E4438C	May 2008
Spectrum Analyzer	Agilent	E4440A	May 2008
Spectrum Analyzer	R&S	FSP40	Jan. 2008
Preamplifier	Agilent	8449B	May 2008
Test Receiver	Rohde & Schwarz	ESVS10	May 2008
Ultra-Broadband Antenna	Rohde & Schwarz	HL562	Sep. 2007
Horn Antenna	Electro-Metrics	RGA-60	Dec. 2007
Anechoic Chamber	SY Corporation	L x W x H 9.6 x 6.4 x 6.4	Aug. 2008

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## 1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

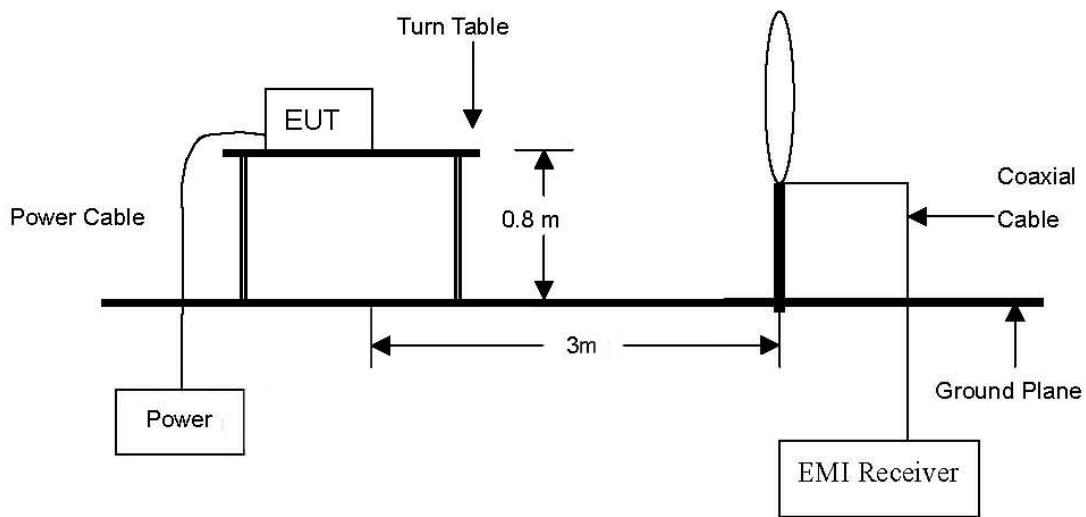
<b>APPLIED STANDARD:FCC Part15, Subpart C</b>		
<b>Standard Section</b>	<b>Test Item</b>	<b>Result</b>
15.209(a) 15.231(b)	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
15.231(c)	Bandwidth of Operation frequency	Complied
15.231(a)	Transmission Time	Complied

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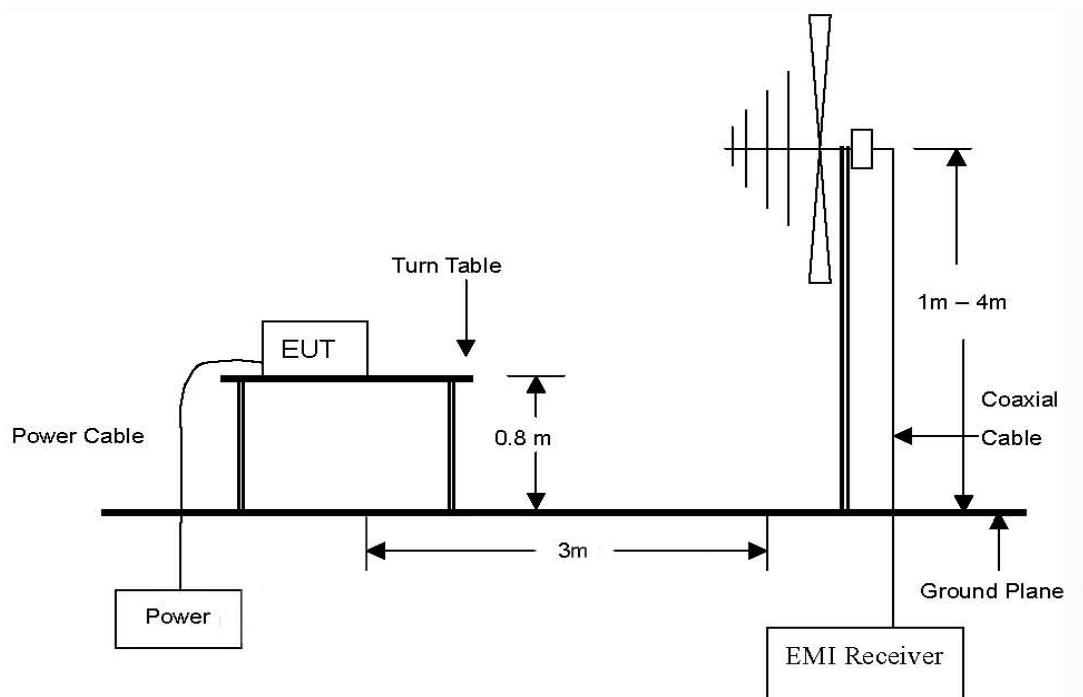
## 2. Field Strength of Fundamental

### 2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.

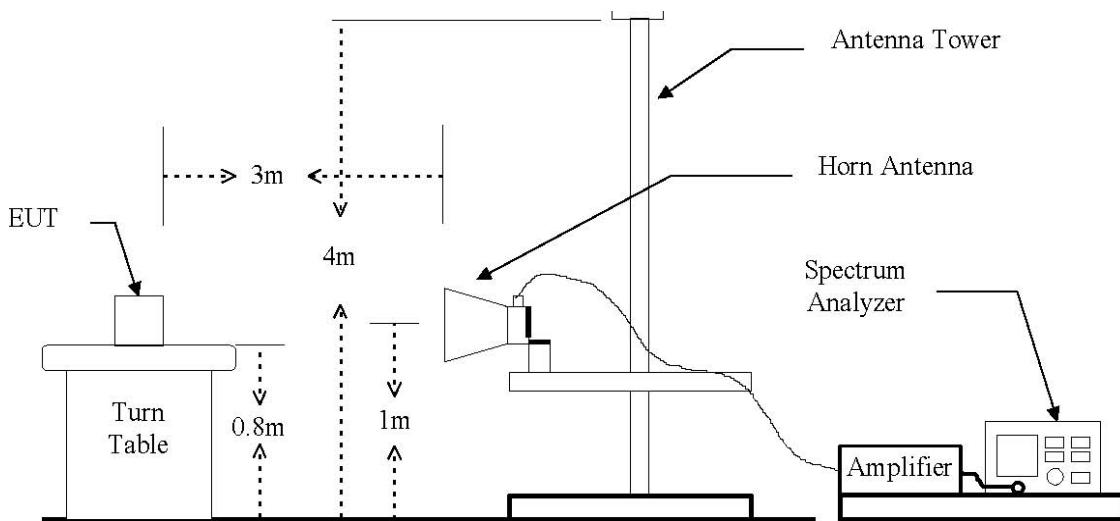


The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 18 GHz Emissions.



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## 2.2. Limit

### 2.2.1. Radiated emission limits, general requirements

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	2400/F(kHz)	30
1.705 – 30.0	30	30
30 -88	100**	3
88 -216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241

### 2.2.2. Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 – 47.70	2,250	225
70 - 130	1,250	125
130 – 174	1,250 to 3,750 **	125 to 375 **
174 – 260	3,750	375
260 – 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

\*\* linear interpolations

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows : for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F)-6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)-7083.333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

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## 2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

### 2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

### 2.3.2. Test Procedures for emission from 30 MHz to 1000 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 meter away from the interference-receiving antenna.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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## 2.4. Test Result

Ambient temperature : 24°C      Relative humidity : 51%

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical

Radiated Emissions		Ant	Correction Factors		Result	FCC Limit	
Frequency (MHz)	Pk Reading (dBuV)	Pol.	AF (dB/m)	Cable (dB)	Pk Level (dBuV/m)	Av Limit (dBuV/m)	Margin (dB)
314.980	56.6	H	11.39	2.34	70.33	75.62	5.29

**Remark:**

To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

**Note:**

1. A Peak limit is 20 dB above the average limit.

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### 3. Spurious Emission

#### 3.1. Test Setup

Same as section 2.1 of this report

#### 3.2. Limit

Same as section 2.2 of this report

#### 3.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

##### 3.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### 3.3.2. Test Procedures for emission from 30 MHz to 1000 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 meter away from the interference-receiving antenna.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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### 3.4. Test Result

Ambient temperature : 24°C      Relative humidity : 51%

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical

Radiated Emissions		Ant	Correction Factors			Result	FCC Limit	
Frequency (MHz)	Pk Reading (dBuV)	Pol.	AF (dB/m)	Cable (dB)	Amp (dB)	Pk Level (dBuV/m)	Av Limit (dBuV/m)	Margin (dB)
630.000	10.3	H	17.50	3.35	0.00	31.15	55.62	24.47
944.948	22.2	H	20.78	4.25	0.00	47.23	55.62	8.39
1260.270	54.5	H	24.99	4.54	35.28	48.75	55.62	6.87
1574.980	53.5	H	25.74	5.30	35.09	49.45	54.00	4.55
1890.230	53.67	V	26.49	6.19	34.91	51.44	55.62	4.18
2143.630	52.5	H	27.10	6.35	34.89	51.06	55.62	4.56
Above 2200 MHz	Not Detected	-	-	-	-	-	-	-

**Remark:**

To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

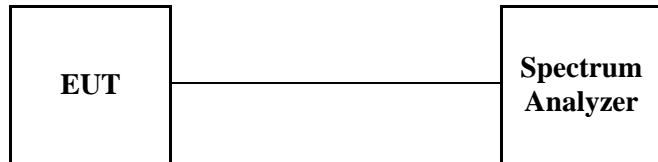
**Note:**

1. A Peak limit is 20 dB above the average limit.
2. Other Spurious Frequencies were not detected up to 4000 MHz.

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## 4. Bandwidth of Operation Frequency

### 4.1. Test Setup



### 4.2. Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 4.3. Test Procedure

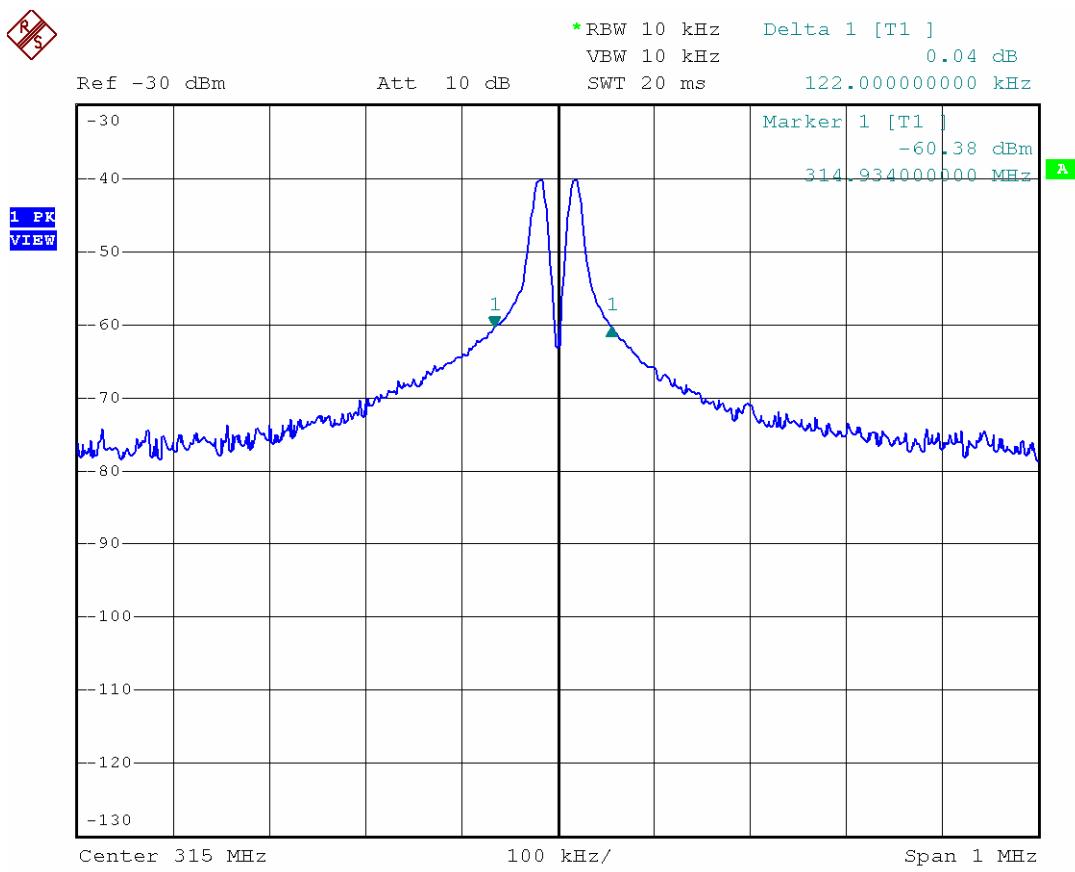
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=10 kHz, VBW=10 kHz and Span=1000 kHz.
3. The bandwidth of fundamental frequency was measured and recorded.

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#### 4.4. Test Result

Ambient temperature : 24°C      Relative humidity : 51%

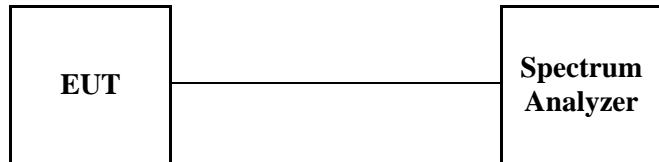
Carrier Frequency	Bandwidth of the emission (kHz)	Limit (kHz)	Remark
315	122	787.5	The point 20 dB down from the modulated carrier



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## 5. Transmission Time

### 5.1. Test Setup



### 5.2. Limit

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### 5.3. Test Procedure

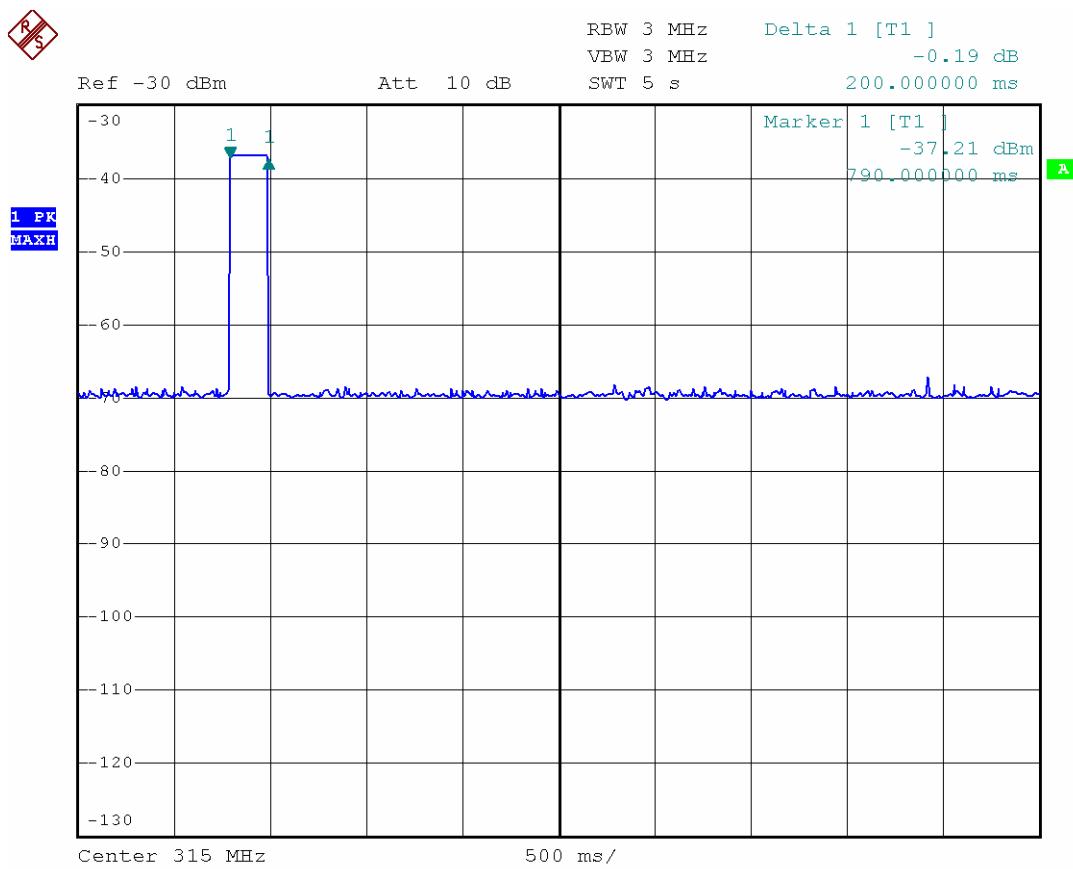
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=3 MHz, VBW=3 MHz, Span=0 Hz, Sweep Time=5 sec
3. The bandwidth of fundamental frequency was measured and recorded.

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## 5.4. Test Result

Ambient temperature : 24°C      Relative humidity : 51%

Carrier Frequency	Bandwidth of the emission (sec)	Limit (sec)	Remark
315	0.200	5	Pass



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## Appendix A. Photo of Field Strength & Spurious Emission Test



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