



# Test Report

Product Name : ORO Transmitter  
 Model No. : FRSFM13B  
 FCC ID. : W55FRSFM13B

Applicant : Oro Technology Co., LTD  
 Address : 3F, No.32-1, 24th Road, Industrial Park, Taichung 408,  
 Taiwan

Date of Receipt : 2011/12/19  
 Issued Date : 2011/12/30  
 Report No. : 11C359R-RFUSP41V01  
 Report Version : V1.0

The test results relate only to the samples tested.  
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 This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

# Test Report Certification

Issued Date : 2011/12/30

Report No. : 11C359R-RFUSP41V01



Product Name : ORO Transmitter  
 Applicant : Oro Technology Co., LTD  
 Address : 3F, No.32-1, 24th Road, Industrial Park, Taichung 408,  
 Taiwan  
 Manufacturer : Oro Technology Co., LTD  
 Model No. : FRSFM13B  
 FCC ID. : W55FRSFM13B  
 EUT Voltage : DC 3V  
 Trade Name : ORO  
 Applicable Standard : FCC 15 Subpart C Section 15.231(e): 2010  
 Test Result : Complied

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Documented By :

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Tested By :

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Approved By :

*Roy Wang*

( Roy Wang / Manager )

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**1. General Information**

**1.1. EUT Description**

Product Name	ORO Transmitter
Trade Name	ORO
Model No.	FRSFM13B
Frequency Range	315 MHz
Antenna Gain	0dBi
Channel Number	1
Type of Modulation	FSK, ASK
Channel Control	Auto
Antenna Type	monopole antenna

Component	
Aluminum Value	1Set

Working Frequency of Each Channel	
Channel	Frequency
001	315 MHz

Note:

1. This device is an ORO Transmitter included a 315MHz transceiver function.
2. These tests are conducted on a sample for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.231.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

**1.3. Test Mode**

QuieTek verified the construction and function in typical operation. All the test modes are performed in normal operation and are defined as:

Pre-Test Mode	
TX	Mode 1: Transmit
Final Test Mode	
TX	Mode 1: Transmit

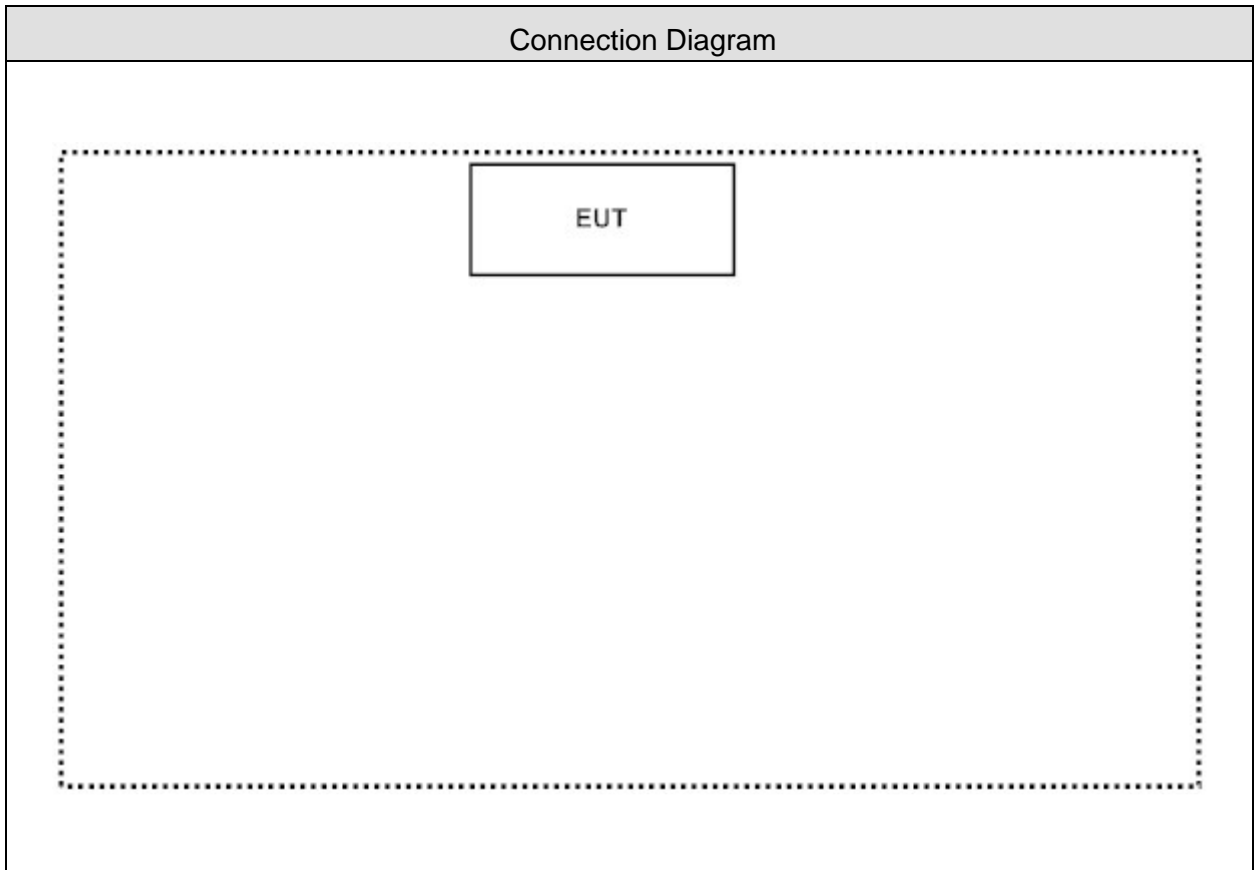
Emission	
Performed Item	
Conducted Emission	No
Radiated Emission	Yes
Occupied Bandwidth	Yes
Duty cycle	Yes
Transmitter time	Yes

**1.4. Tested System Details**

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

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
N/A					

**1.5. Configuration of tested System**



**1.6. EUT Exercise Software**

1	Setup the EUT as shown in section 1.5.
2	The EUT will transmit automatically.
3	Verify that the EUT works properly.

**1.7. Test Facility**

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.231 Radiated Emission	15 - 35	22
Humidity (%RH)		25 - 75	55
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Occupied Bandwidth	15 - 35	22
Humidity (%RH)		25 - 75	55
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Duty Cycle	15 - 35	22
Humidity (%RH)		25 - 75	55
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Transmitter Time	15 - 35	22
Humidity (%RH)		25 - 75	55
Barometric pressure (mbar)		860 - 1060	950-1000

Site Description: September 27, 2010 File on  
 Federal Communications Commission  
 Laboratory Division  
 7435 Oakland Mills Road  
 Columbia, MD 21046  
 Registration Number: 365520  
 Accredited by TAF  
 Accreditation Number: 1313  
 Effective through: December 27, 2013



Accredited by NVLAP  
 NVLAP Lab Code: 200347-0  
 Effective through: September 30, 2012



Site Name: Quietek Corporation

Site Address: No.75-1, Wang-Yeh Valley, Yung-Hsing,  
 Chiung-Lin, Hsin-Chu County,  
 Taiwan, R.O.C.  
 TEL : 886-3-592-8858 / FAX : 886-3-592-8859  
 E-Mail : [service@quietek.com](mailto:service@quietek.com)

## 2. Radiated Emission

### 2.1. Test Equipment

The following test equipments are used during the test:

#### Radiated Emission / CB1

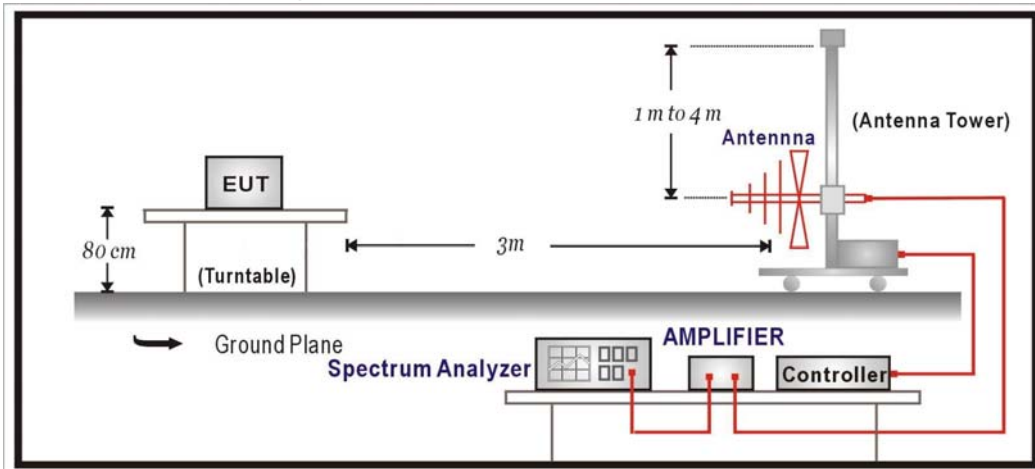
Instrument	Manufacturer	Type No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2012/08/14
Double Ridged Guide Horn Antenna	Schwarzback	BBHA 9120D	743	2012/02/24
Pre-Amplifier	MITEQ	AMF-4D-005180 -24-10P	888003	2012/12/05
Pre-Amplifier	Quietek	AP-025C	CHM-0706049	2012/03/10
Spectrum Analyzer	Agilent	E4440A	MY46187335	2012/01/06
Coaxial Cable	Huber+Suhner AG	Sucoflex 102	25623/2	2012/03/21

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

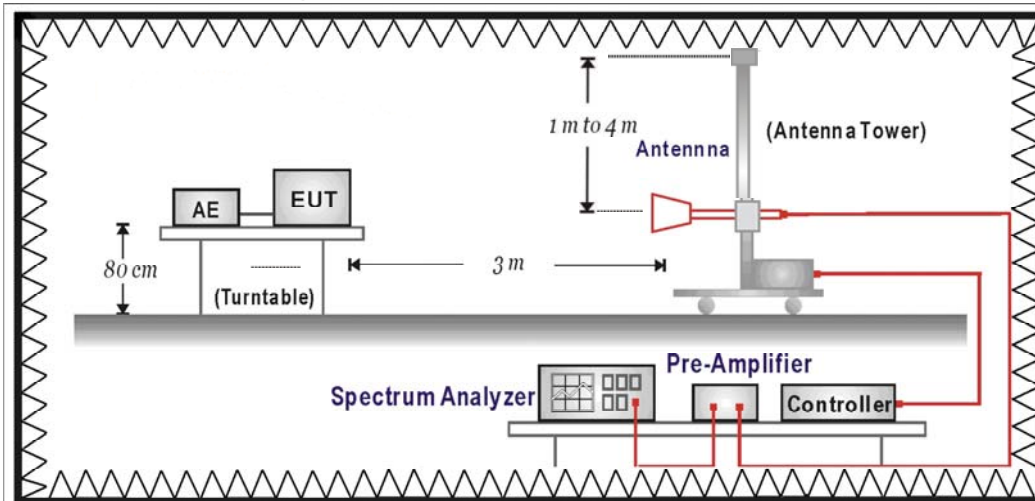


2.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



**2.3. Limits**

➤ Fundamental and Harmonics Emission Limits

<b>FCC Part 15 Subpart C Paragraph 15.231(e) Limits</b>				
Fundamental Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	1000	60	100	40
70-130	500	53.98	50	33,98
130-174	500-1500	53.98-63.52	50-150	33.98-43.52
174-260	1500	63.52	150	43.52
260-470	1500-5000	53.52-73.98	150-500	33.52-53.98
above 470	5000	73.98	500	53.98

- Remarks: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)  
 2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.  
 3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

➤ Spurious electric field strength limits

<b>FCC Part 15 Subpart C Paragraph 15.209 Limits</b>			
Frequency MHz	uV/m	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark <sup>1</sup>	300
0.490-1.705	24000/F(kHz)	See Remark <sup>1</sup>	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

- Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)  
 2. In the Above Table, the tighter limit applies at the band edges.  
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

**2.4. 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 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 beamwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The frequency range from 30MHz to 10th harmonics is checked.

**2.5. Test Specification**

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2010

**2.6. Uncertainty**

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

**2.7. Test Result**

Product	ORO Transmitter		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2011/12/30	Test Site	CB1

Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Peak Measurement Level (dBuV/m)	Average Measurement Level (dBuV/m)	Average Limit (dBuV/m)
<b>Horizontal</b>					
315.000 (X-axis)	12.734	68.003	80.736	59.626	67.660
315.000 (Y-axis)	12.735	61.678	74.413	53.303	67.660
315.000 (Z-axis)	12.733	57.918	70.651	49.541	67.660
<b>Vertical</b>					
315.000 (X-axis)	12.734	54.790	67.524	46.414	67.660
315.000 (Y-axis)	12.733	68.466	81.199	60.089	67.660
315.000 (Z-axis)	12.737	66.658	79.395	58.285	67.660

Note1:

Peak Measurement Level = Reading Level + Correct Factor

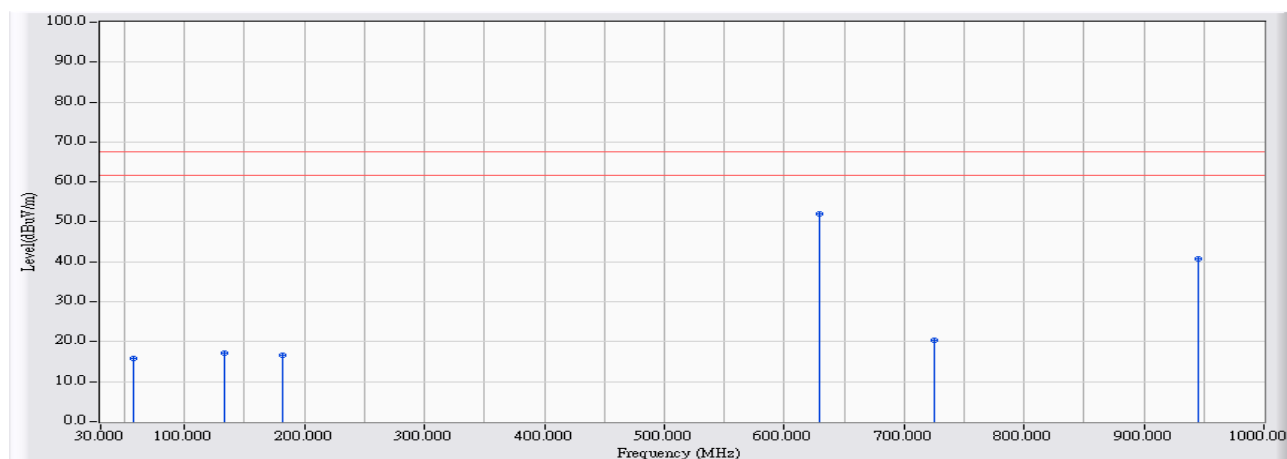
Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)

Duty Cycle=(Ton/(Ton+Toff)) = 8.8/100 = 0.088

20\*Log(Duty Cycle) = -21.11

### 30MHz-1GHz Spurious:

Site : CB1	Time : 2011/12/20 - 11:48
Limit : FCC_SpartC_15.231(e)_H_315MHz_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 3V
EUT : ORO Transmitter	Note : 315MHz(Y-axis)

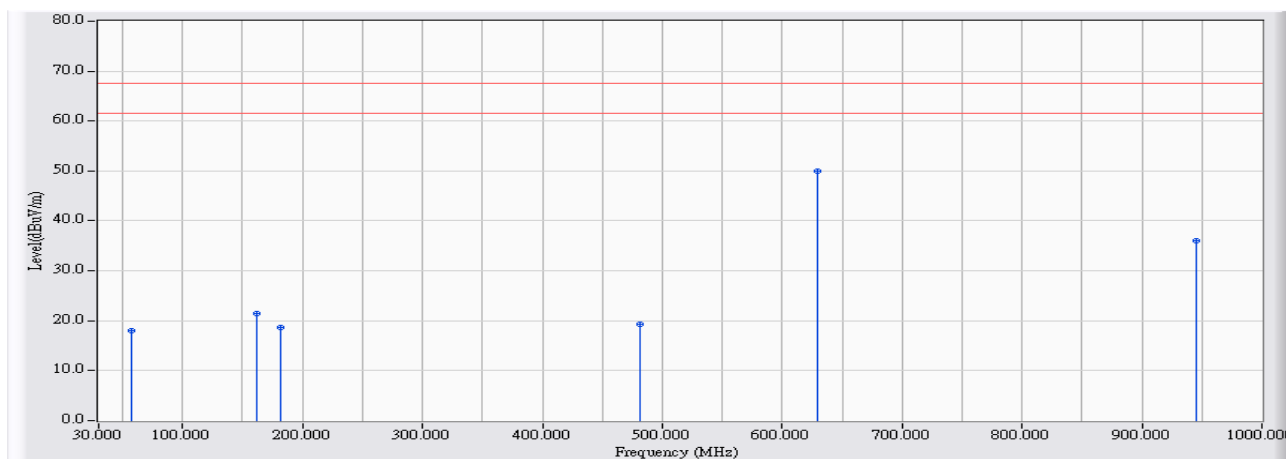


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	57.483	-17.430	33.301	15.871	-51.789	67.660	PEAK
2	133.467	-12.568	29.593	17.025	-50.635	67.660	PEAK
3	181.158	-14.715	31.468	16.753	-50.907	67.660	PEAK
4	* 629.783	-4.183	56.265	52.082	-15.578	67.660	PEAK
5	725.167	-3.611	23.922	20.311	-47.349	67.660	PEAK
6	945.033	-1.503	42.168	40.665	-26.995	67.660	PEAK

**Note:**

1. All Reading Levels are Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	Time : 2011/12/20 - 11:49
Limit : FCC_SpartC_15.231(e)_H_315MHz_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 3V
EUT : ORO Transmitter	Note : 315MHz(Y-axis)



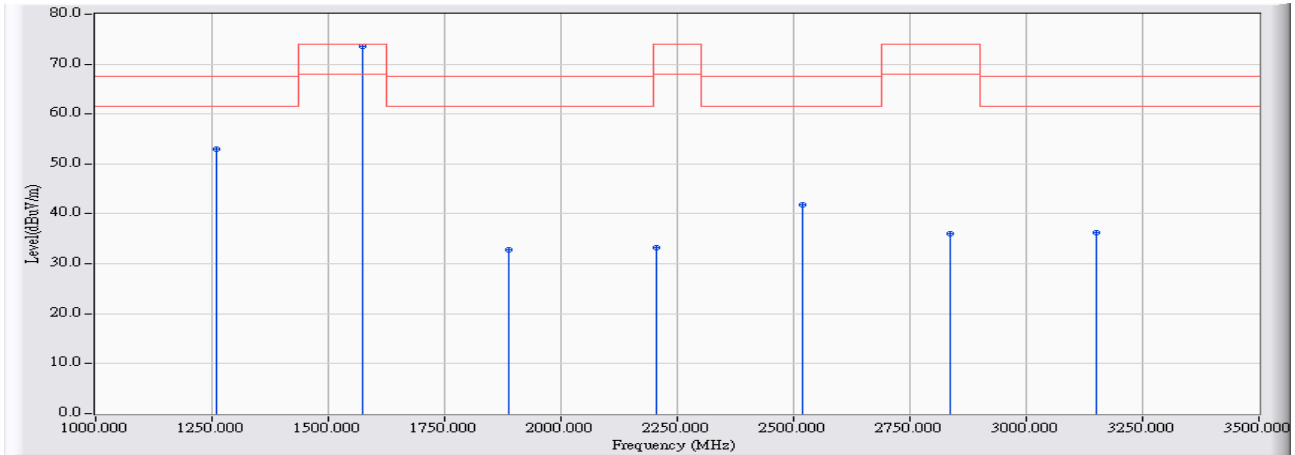
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	57.483	-17.430	35.346	17.916	-49.744	67.660	PEAK
2	161.758	-14.003	35.499	21.496	-46.164	67.660	PEAK
3	181.158	-14.715	33.373	18.658	-49.002	67.660	PEAK
4	481.858	-5.724	25.077	19.353	-48.307	67.660	PEAK
5	* 629.783	-4.183	54.206	50.023	-17.637	67.660	PEAK
6	945.033	-1.503	37.572	36.069	-31.591	67.660	PEAK

Note:

1. All Reading Levels are Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### Above 1GHz Spurious:

Site : CB1	Time : 2011/12/20 - 10:40
Limit : FCC_SpartC_15.231(e)_H_315MHz_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 3V
EUT : ORO Transmitter	Note : 315MHz(Y-axis)

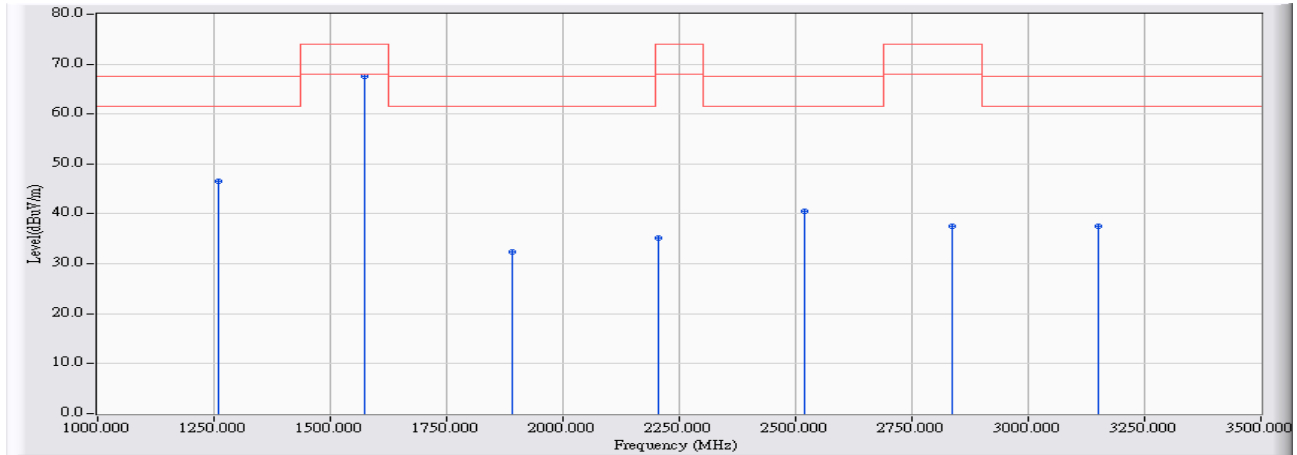


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1259.680	-10.743	63.730	52.988	-14.672	67.660	PEAK
2	* 1575.030	-10.098	83.770	73.671	-0.329	74.000	PEAK
3	1888.930	-8.830	41.620	32.790	-34.870	67.660	PEAK
4	2205.180	-7.279	40.430	33.150	-40.850	74.000	PEAK
5	2520.310	-6.288	48.080	41.792	-25.868	67.660	PEAK
6	2835.310	-5.760	41.790	36.030	-37.970	74.000	PEAK
7	3150.310	-4.553	40.810	36.258	-31.402	67.660	PEAK

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. “ \* ”, means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)  
 $Duty\ Cycle = (Ton / (Ton + Toff)) = 8.8 / 100 = 0.088$   
 $20 * Log(Duty\ Cycle) = -21.11$
5. The average measurement was not performed when the peak measured data under the limit of peak detection.

Site : CB1	Time : 2011/12/20 - 10:41
Limit : FCC_SpartC_15.231(e)_H_315MHz_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 3V
EUT : ORO Transmitter	Note : 315MHz(Y-axis)



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1259.810	-10.742	57.350	46.608	-21.052	67.660	PEAK
2	* 1575.160	-10.098	77.610	67.512	-6.488	74.000	PEAK
3	1889.930	-8.825	41.280	32.456	-35.204	67.660	PEAK
4	2204.510	-7.284	42.400	35.117	-38.883	74.000	PEAK
5	2520.030	-6.289	46.850	40.561	-27.099	67.660	PEAK
6	2837.450	-5.752	43.370	37.618	-36.382	74.000	PEAK
7	3150.580	-4.552	42.110	37.559	-30.101	67.660	PEAK

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. “ \* ”, means this data is the worst emission level.
4. Measurement Level = Reading Level + Correct Factor.
5. Average Measurement Level = Peak Measurement Level + 20Log (Duty Cycle)  
 $Duty\ Cycle = (Ton / (Ton + Toff)) = 8.8 / 100 = 0.088$   
 $20 * Log(Duty\ Cycle) = -21.11$
5. The average measurement was not performed when the peak measured data under the limit of peak detection.



**3. Occupied Bandwidth**

**3.1. Test Equipment**

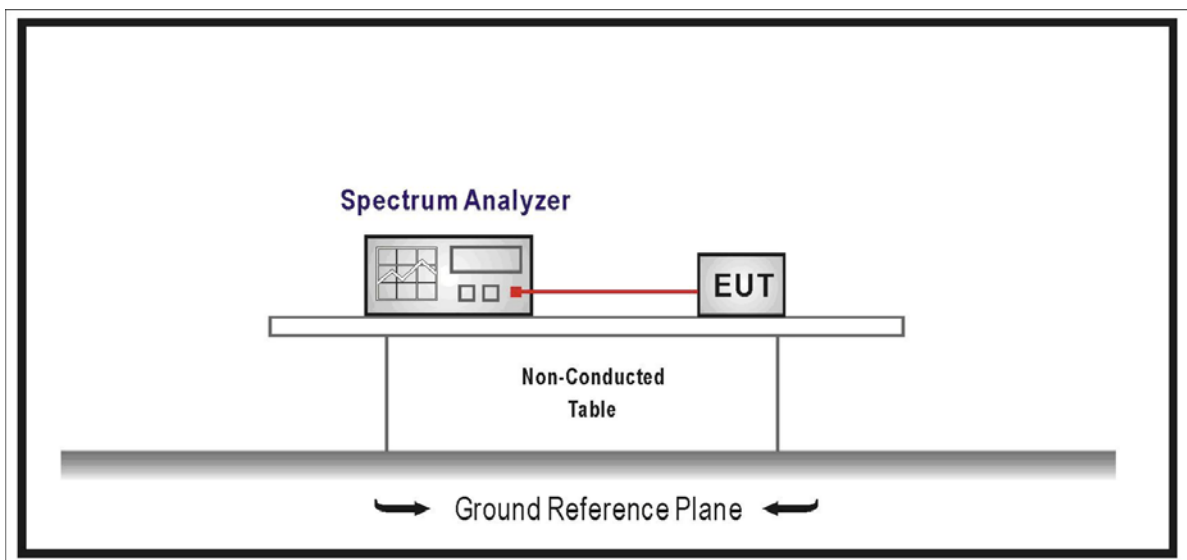
The following test equipments are used during the radiated emission tests:

**Occupied Bandwidth / SR7**

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2012/01/06

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

**3.2. Test Setup**



**3.3. Limits**

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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**3.4. Test Specification**

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2010

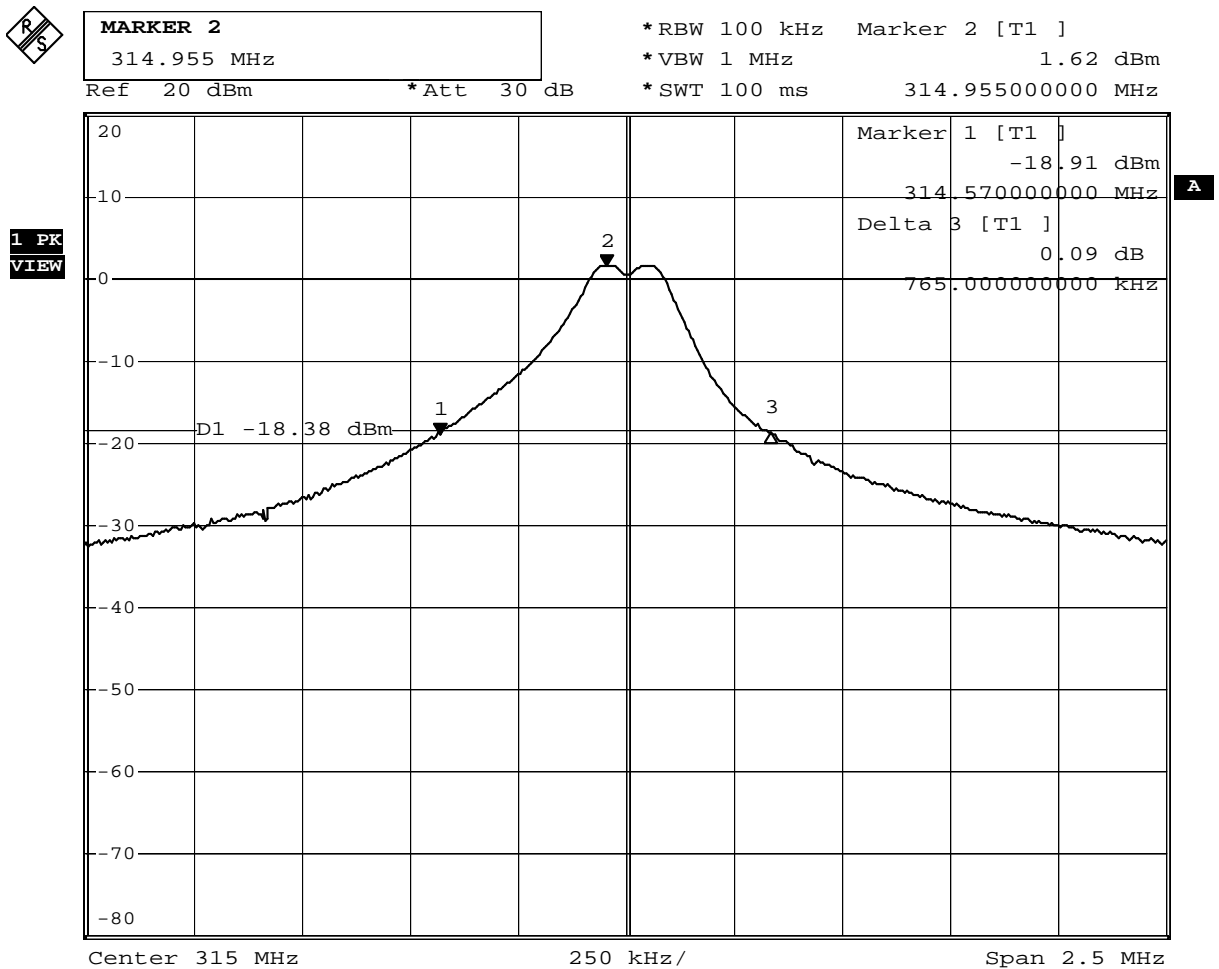
**3.5. Uncertainty**

± 150Hz

### 3.6. Test Result

Product	ORO Transmitter		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2011/12/21	Test Site	SR7

Center Frequency	315 MHz
Allowable Bandwidth (70-900 MHz: 0.25%, Above 900MHz: 0.5%)	787.50 KHz
Bandwidth at 20dB down (Max)	765.00 KHz
Result	PASS



Date: 21.DEC.2011 13:44:24

**4. Duty cycle**

**4.1. Test Equipment**

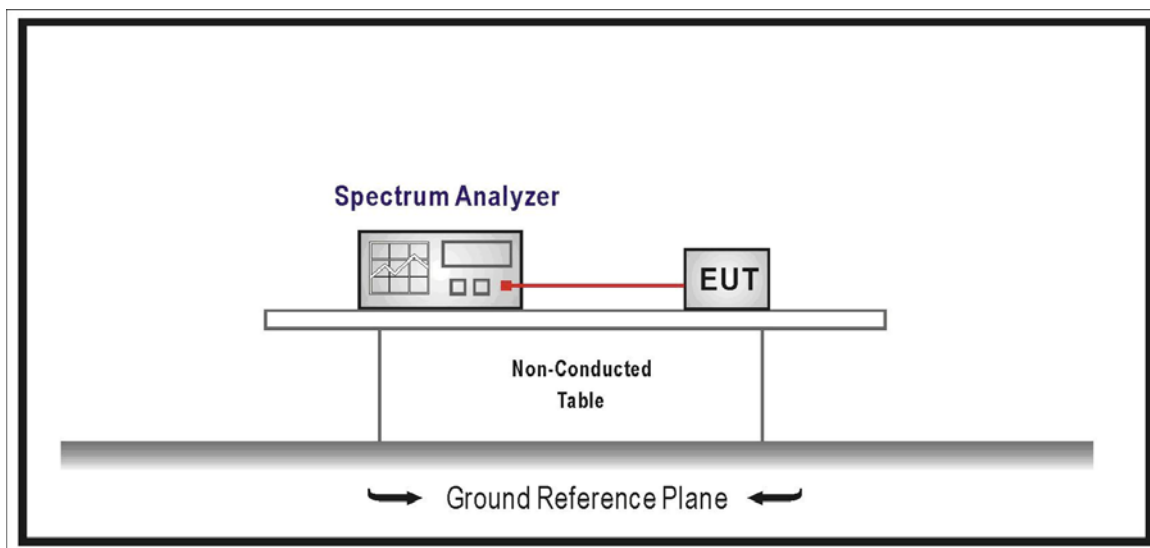
The following test equipments are used during the radiated emission tests:

**Duty cycle / SR7**

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2012/01/06

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

**4.2. Test Setup**



**4.3. Limits**

N/A

**4.4. Test Specification**

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2010

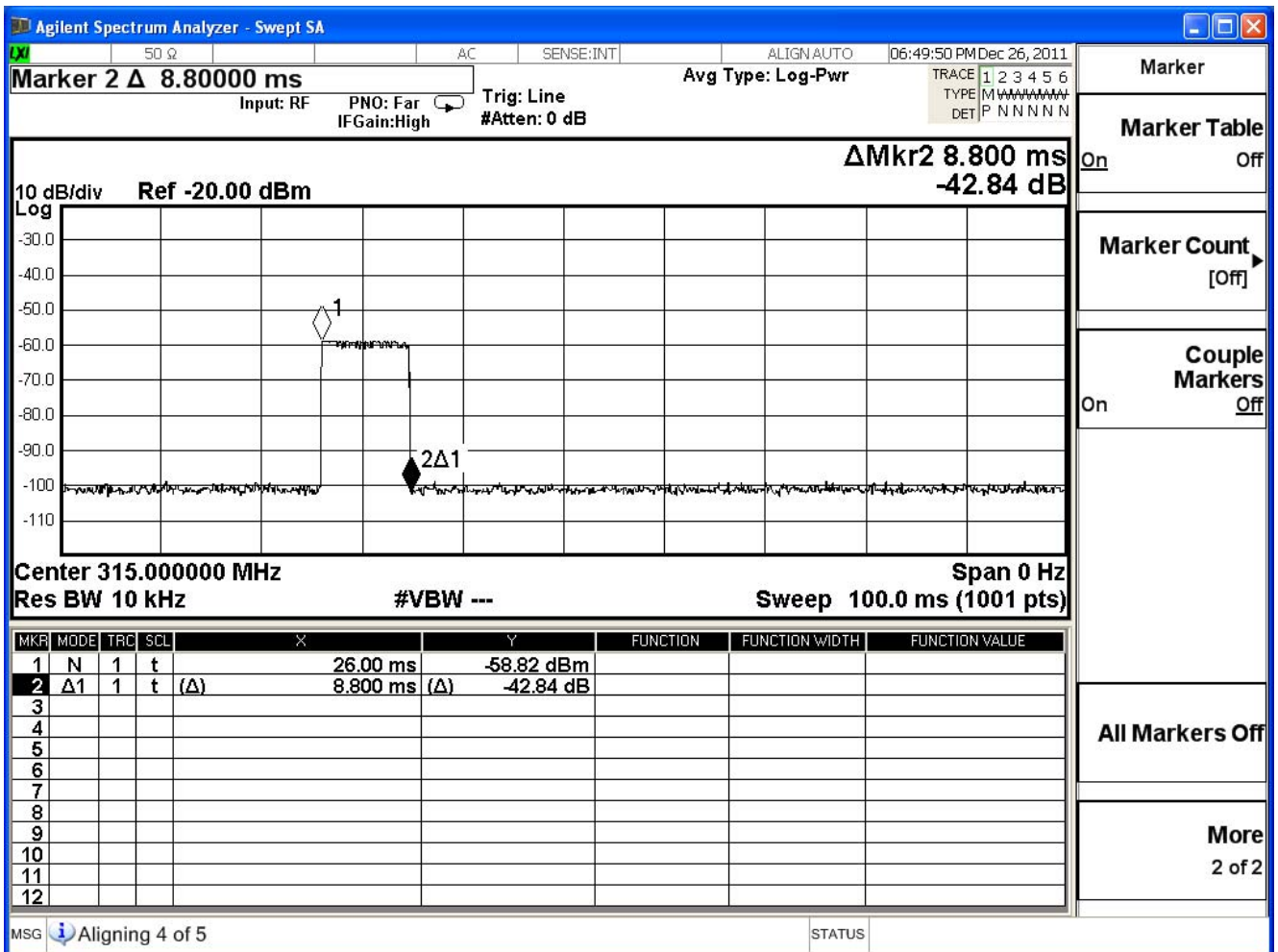
**4.5. Uncertainty**

± 25msec

## 4.6. Test Result

Product	ORO Transmitter		
Test Item	Duty Cycle		
Test Mode	Mode 1: Transmit		
Date of Test	2011/12/21	Test Site	SR7

Center Frequency	315 MHz
Ton= 8.80ms	
Ton+Toff= 100ms	
Duty Cycle= 0.088/100%	8.80%



**5. Transmitter time**

**5.1. Test Equipment**

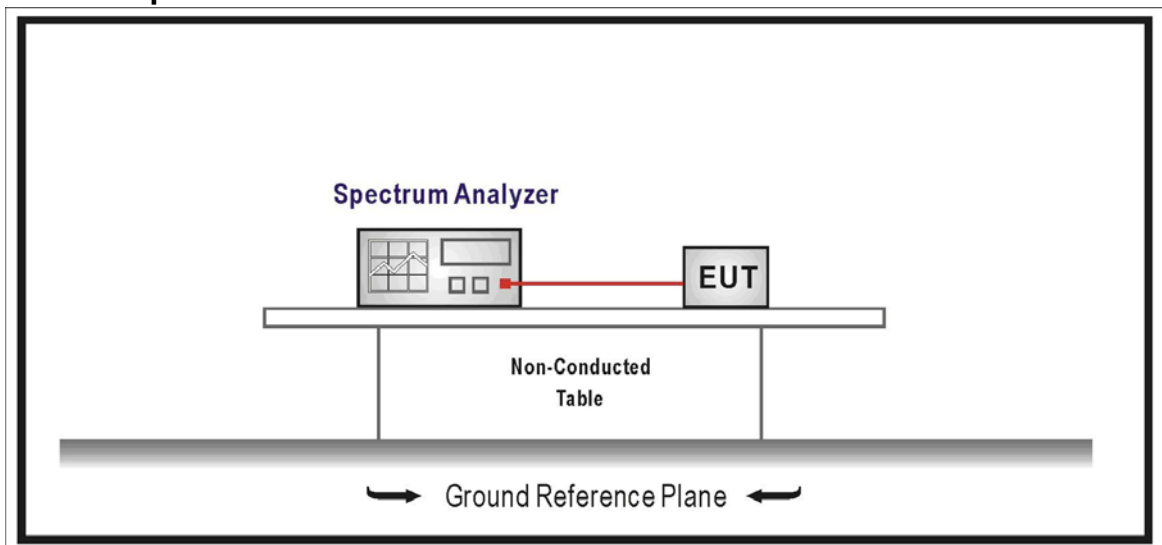
The following test equipments are used during the radiated emission tests:

**Transmitter time / SR7**

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2012/01/06

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

**5.2. Test Setup**



**5.3. Limits**

The duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

**5.4. Test Specification**

According to FCC Part 15 Subpart C Paragraph 15.231(e): 2010

**5.5. Uncertainty**

± 25msec

## 5.6. Test Result

Product	ORO Transmitter		
Test Item	Transmitter time		
Test Mode	Mode 1: Transmit		
Date of Test	2011/12/21	Test Site	SR7

Frequency (MHz)	Transmitter time (ms.)		Silent period (sec.)	
	Measure value	Limit	Measure value	Limit
433.92	8.8	1000	29.68	10

Result	PASS
--------	------

### Transmitter time in 100ms

