Test Report

Product Name	：	Tire Pressure Monitoring System
Model No.	：	TR01
FCC ID.	：	W55TR1FM1B2

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

Date of Receipt	：	2012/02/09
Issued Date	：	2012/02/22
Report No.	：	122312R-RFUSP41V01
Report Version	：	V1.0

Test Report Certification

Issued Date : 2012/02/22
Report No. : 122312R-RFUSP41V01

QuieTek

Product Name	:	Tire Pressure Monitoring System
Applicant	:	Oro Technology Co., LTD
Address	:	3F, No.32-1, 24th Road, Industrial Park, Taichung 408, Taiwan
Manufacturer	:	Oro Technology Co., LTD
Model No.	:	TR01
FCC ID.	:	W55TR1FM1B2
EUT Voltage	:	DC 3V
Trade Name	:	ORO
Applicable Standard	:	FCC 15 Subpart C Section 15.231(e): 2010
Test Result	:	Complied

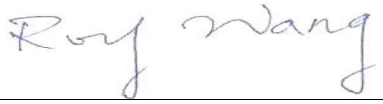
The test results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : 

(Carol Tsai / Adm. Specialist)

Tested By : 

(Quale Tang / Engineer)

Approved By : 

(Roy Wang / Manager)

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1. General Information

1.1. EUT Description

Product Name	Tire Pressure Monitoring System
Trade Name	ORO
Model No.	TR01
Frequency Range	433.92 MHz
Antenna Gain	0dBi
Channel Number	1
Type of Modulation	FSK, ASK
Channel Control	Auto
Antenna Type	Monopole antenna

Component	
Aluminum Value	4Set
Nylon Screw	4Set
Magnetic Holder	1Set
Transmission Cable	Shielded, 2.0m, 1 Pcs
SMA Terminal	1Set
Long Antenna	Shielded, 12m, 1 Pcs
Short Antenna	Shielded, 4m, 1 Pcs
Antenna Holder	2Set
Cable Tie	20PCS
Power Cable	I/P: DC 9V~36V O/P: DC 6V/1A Cable In: Non-Shielded, 1m Cable Out: Non-Shielded, 1m

Working Frequency of Each Channel	
Channel	Frequency
001	433.92 MHz

Note:

1. This device is a Tire Pressure Monitoring System included a 433.92MHz 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.
4. This device is a composite device in accordance with Part 15 regulations. The function receiving was measured and made a test report that the report number is 122312-RFUSP37V02 under Declaration of Conformity.

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

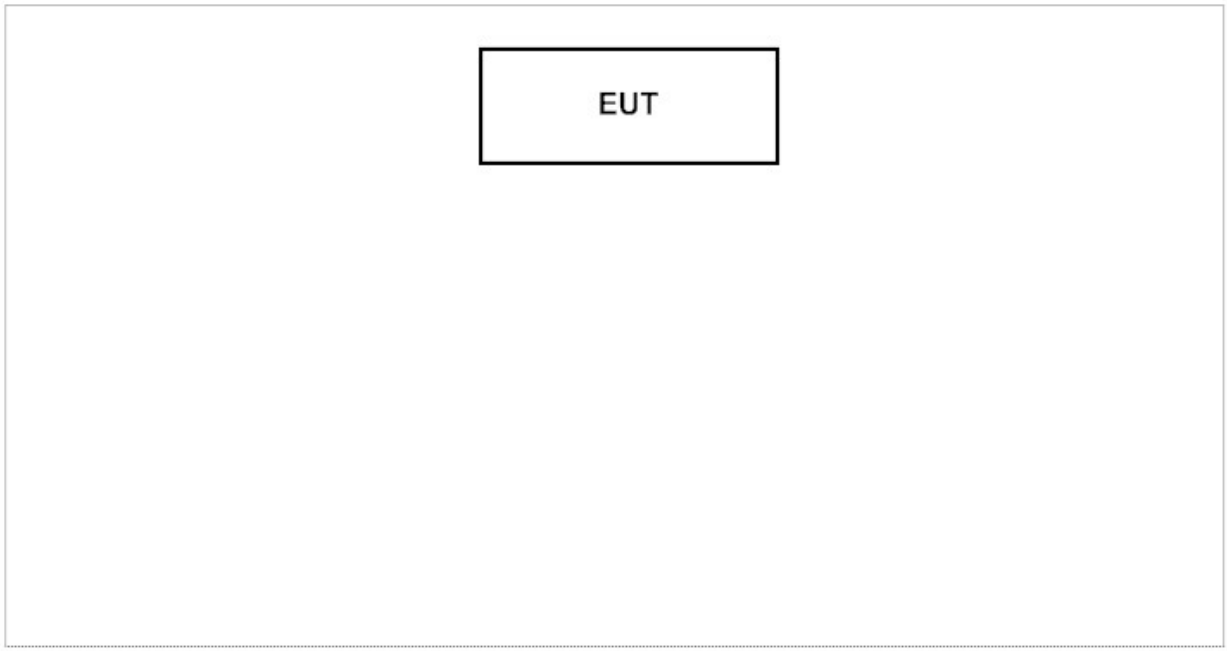
1.4. Tested System Details

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

Connection Diagram



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	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Occupied Bandwidth	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Duty Cycle	15 - 35	25
Humidity (%RH)		25 - 75	48
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.231 Transmitter Time	15 - 35	25
Humidity (%RH)		25 - 75	48
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

Testing Laboratory 1313

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

NVLAP Lab Code : 200347-0

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

2. Radiated Emission

2.1. Test Equipment

The following test equipments are used during the test:

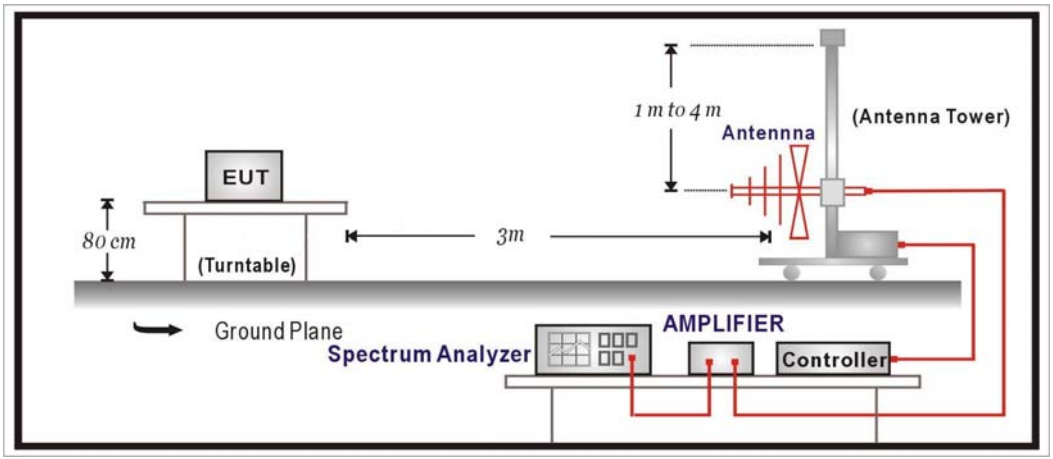
Radiated Emission / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2012/08/14
Double Ridged Guide Horn Antenna	Schwarzback	BBHA 9120D	743	2013/02/02
Pre-Amplifier	MITEQ	AMF-4D-005180-24-10P	888003	2012/12/05
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2013/02/02
Spectrum Analyzer	Agilent	E4440A	MY46187335	2013/02/07
Coaxial Cable	Huber+Suhner AG	Sucoflex 102	25623/2	2012/03/21

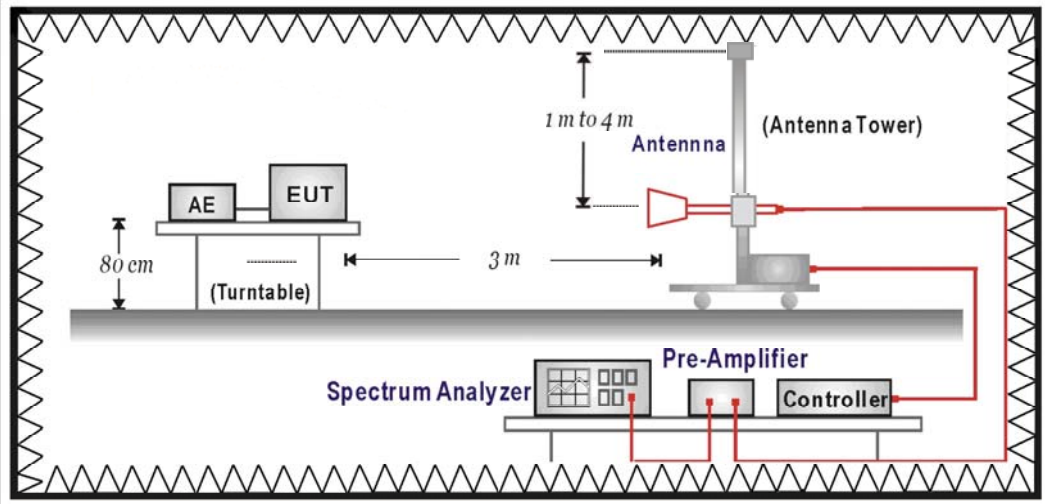
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

2.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



2.3. Limits

➢ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.231(e) Limits				
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

FCC Part 15 Subpart C Paragraph 15.209 Limits			
Frequency MHz	uV/m	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark[1]	300
0.490-1.705	24000/F(kHz)	See Remark[1]	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 harminics 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	Tire Pressure Monitoring System		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2012/02/18	Test Site	CB1

Frequency (MHz)	Correct Factor(dB)	Reading Level (dBuV)	Peak Emission Level (dBuV/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)
Horizontal					
433.920(X-axis)	15.631	70.504	86.136	65.026	72.870
433.920(Y-axis)	15.631	63.250	78.882	57.772	72.870
433.920(Z-axis)	15.631	68.361	83.993	62.883	72.870
Vertical					
433.920(X-axis)	15.631	56.553	72.185	51.075	72.870
433.920(Y-axis)	15.631	71.983	87.615	66.505	72.870
433.920(Z-axis)	15.631	67.919	83.551	62.441	72.870

Peak Emission Level = Reading Level+ Correct Factor

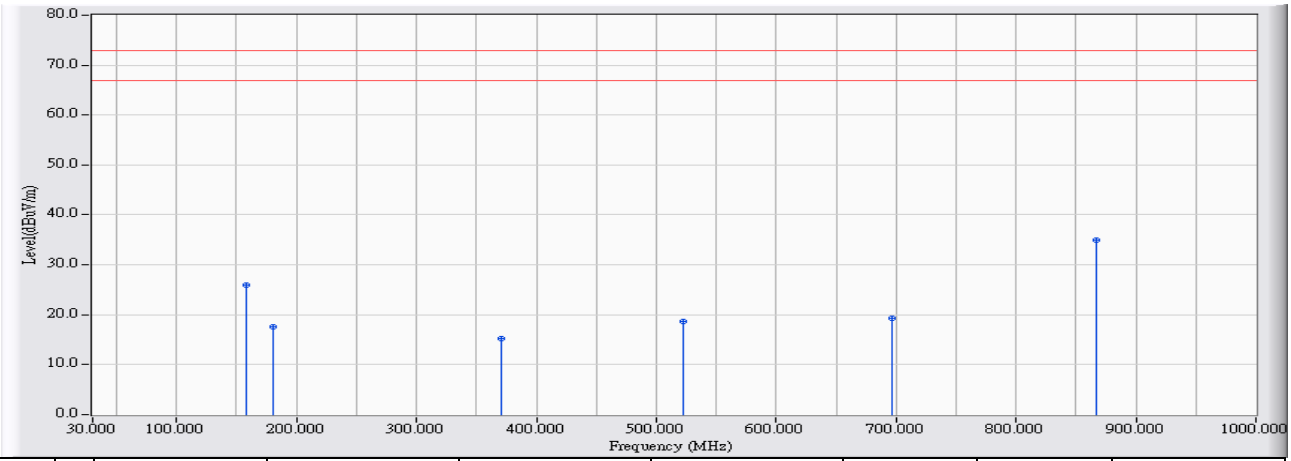
Average Emission Level = Peak Emission Level + 20Log(Duty cycle)

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

20Log(Duty cycle)=-21.11

30MHz-1GHz Spurious :

Site : CB1	**Time : 2012/02/18 - 11:47**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note :**

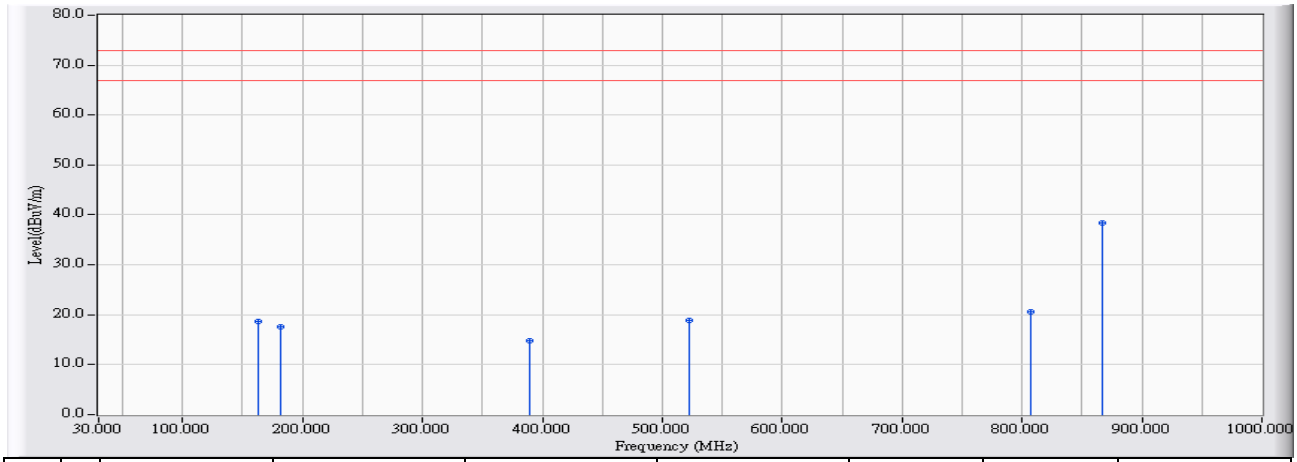


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		157.717	-13.823	39.879	26.056	-46.814	72.870	PEAK
2		180.350	-14.715	32.322	17.607	-55.263	72.870	PEAK
3		371.117	-8.204	23.450	15.246	-57.624	72.870	PEAK
4		523.083	-5.078	23.753	18.675	-54.195	72.870	PEAK
5		696.067	-3.948	23.356	19.407	-53.463	72.870	PEAK
6	*	867.433	-2.214	37.282	35.067	-37.803	72.870	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 : 2012/02/18 - 11:47**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note :**



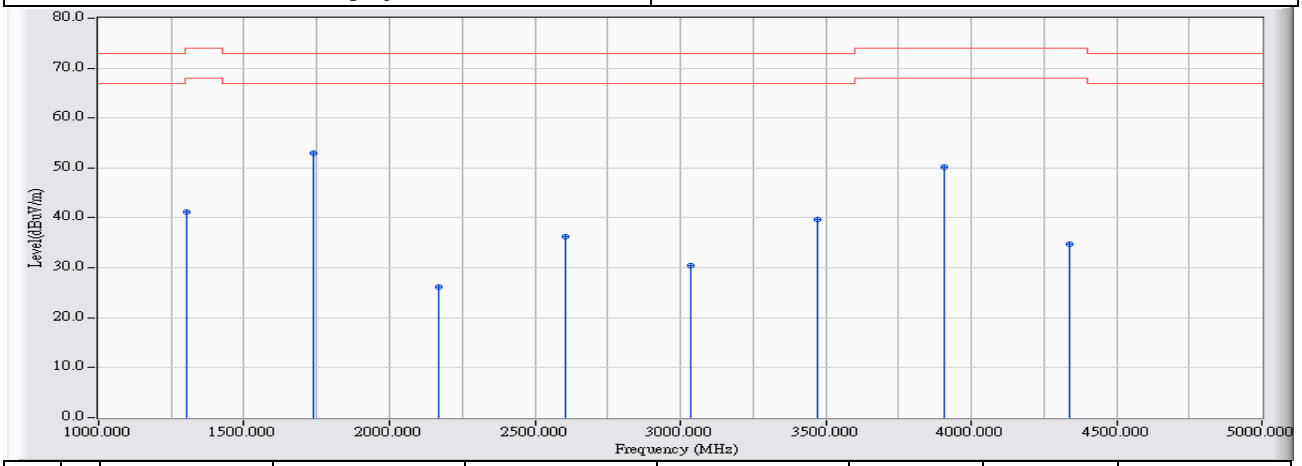
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		162.567	-14.034	32.682	18.648	-54.222	72.870	PEAK
2		181.967	-14.715	32.384	17.669	-55.201	72.870	PEAK
3		388.900	-7.690	22.545	14.854	-58.016	72.870	PEAK
4		523.083	-5.078	24.018	18.940	-53.930	72.870	PEAK
5		807.617	-2.600	23.138	20.539	-52.331	72.870	PEAK
6	*	867.433	-2.214	40.658	38.443	-34.427	72.870	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 : 2012/02/09 - 16:17**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note :**

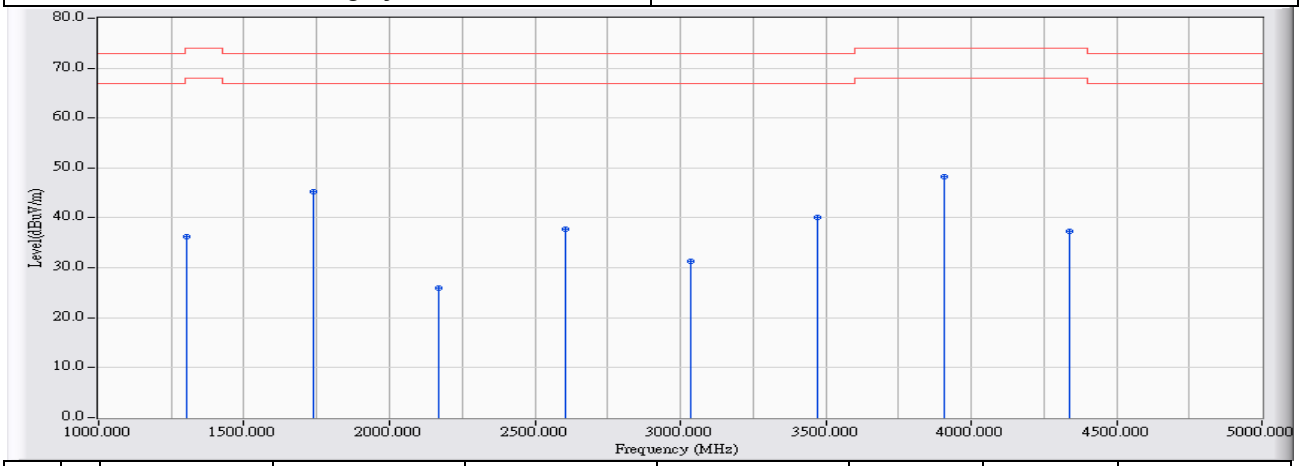


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1302.100	-10.528	51.710	41.182	-32.818	74.000	PEAK
2	*	1736.150	-9.583	62.500	52.918	-19.952	72.870	PEAK
3		2169.350	-7.317	33.390	26.072	-46.798	72.870	PEAK
4		2603.500	-6.075	42.390	36.316	-36.554	72.870	PEAK
5		3038.260	-4.870	35.220	30.351	-42.519	72.870	PEAK
6		3472.280	-3.168	42.840	39.673	-33.197	72.870	PEAK
7		3906.300	-2.087	52.350	50.264	-23.736	74.000	PEAK
8		4340.330	-0.694	35.400	34.706	-39.294	74.000	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
6. The average measurement was not performed when the peak measured data under the limit of peak detection.

Site : CB1	**Time : 2012/02/09 - 16:17**
Limit : FCC_SpartC_15.231(e)_H_433.92MHz_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 3V**
EUT : Tire Pressure Monitoring System	**Note :**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1301.820	-10.528	46.760	36.232	-37.768	74.000	PEAK
2		1736.140	-9.583	54.930	45.347	-27.523	72.870	PEAK
3		2169.530	-7.317	33.260	25.943	-46.927	72.870	PEAK
4		2170.000	-7.315	33.230	25.915	-46.955	72.870	PEAK
5		2603.630	-6.075	43.880	37.806	-35.064	72.870	PEAK
6		3038.260	-4.870	36.090	31.221	-41.649	72.870	PEAK
7		3471.530	-3.171	43.350	40.180	-32.690	72.870	PEAK
8	*	3906.310	-2.087	50.260	48.174	-25.826	74.000	PEAK
9		4340.360	-0.694	38.080	37.387	-36.613	74.000	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
6. The average measurement was not performed when the peak measured data under the limit of peak detection.

3. Occupied Bandwidth

3.1. Test Equipment

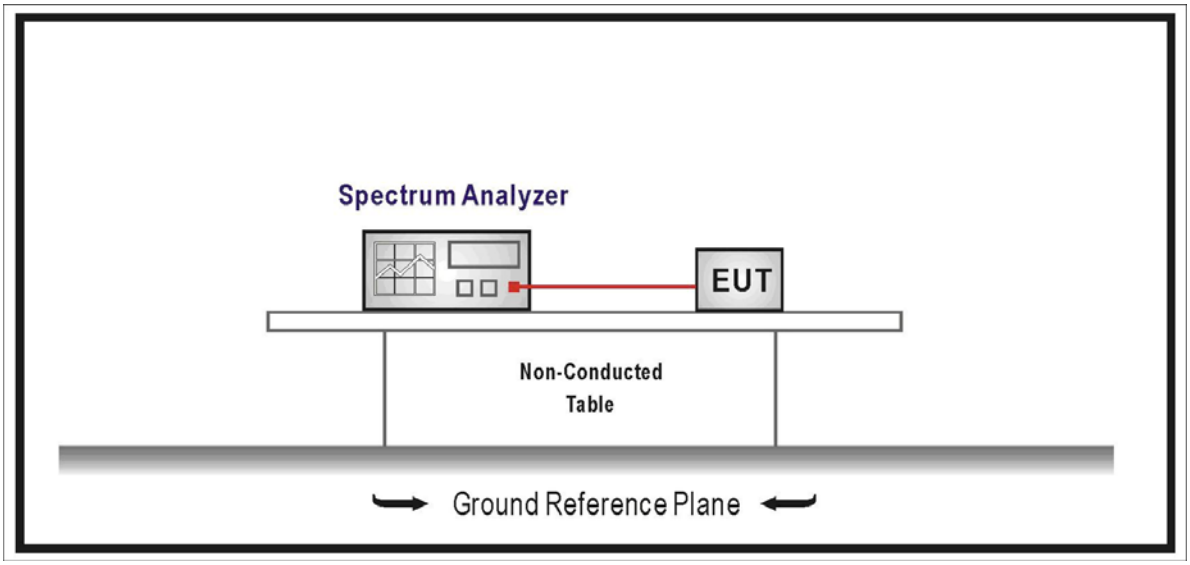
The following test equipments are used during the radiated emission tests:

Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

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

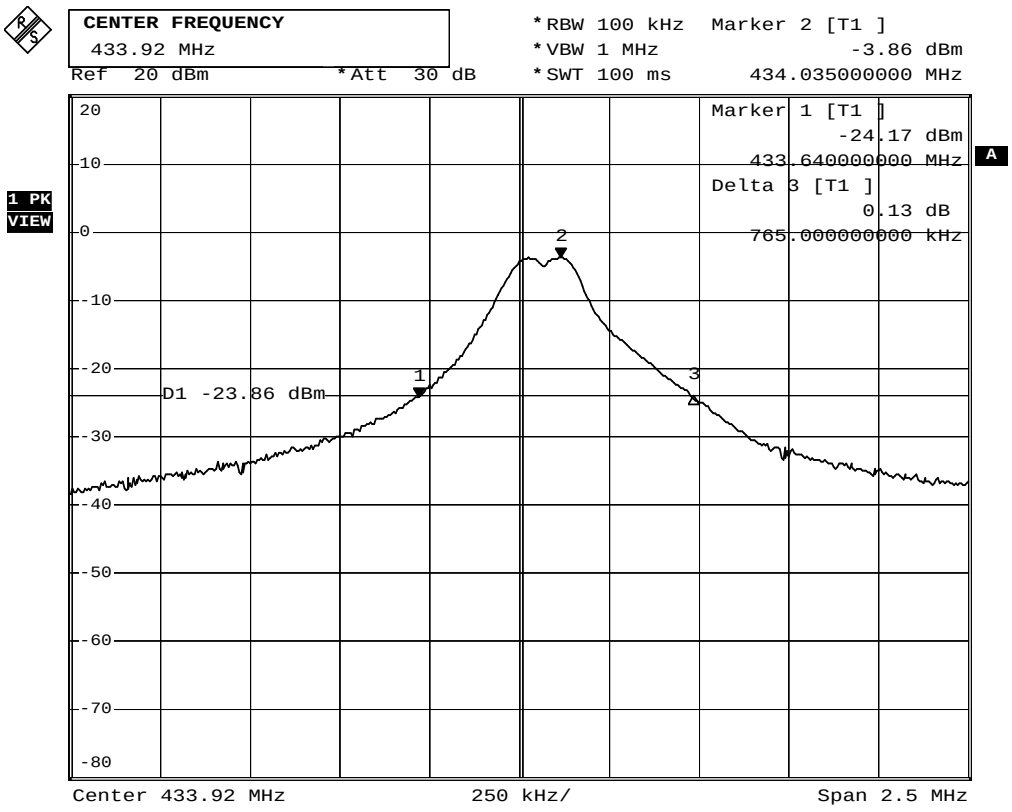
3.5. Uncertainty

± 150Hz

3.6. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/02/18	Test Site	SR7

Center Frequency	433.92 MHz
Allowable Bandwidth (70-900 MHz: 0.25%, Above 900MHz: 0.5%)	1.0848MHz
Bandwidth at 20dB down (Max)	0.7650 MHz
Result	PASS



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4. Duty cycle

4.1. Test Equipment

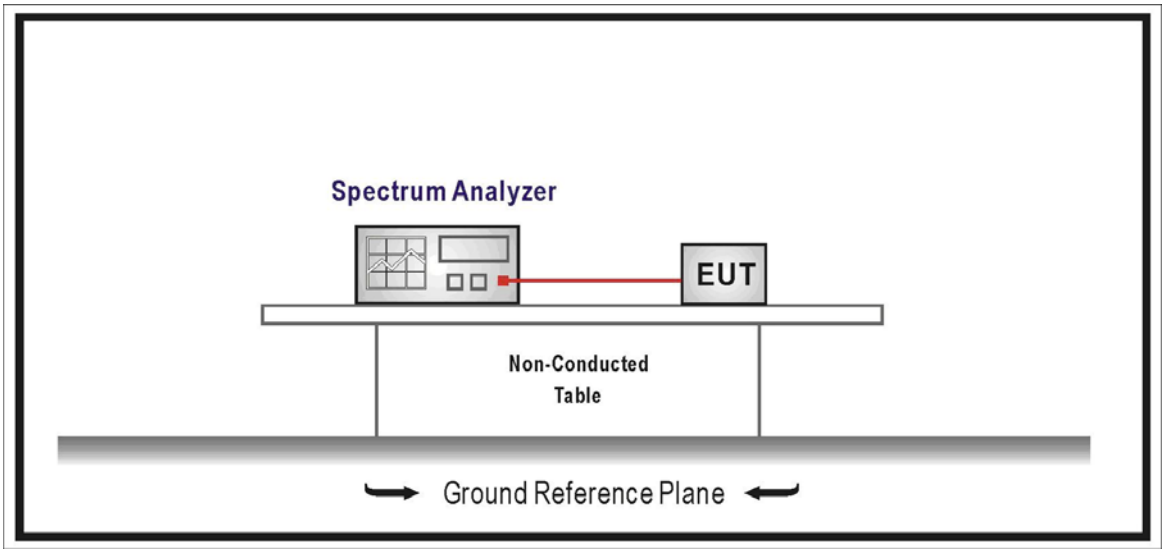
The following test equipments are used during the radiated emission tests:

Duty cycle / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

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

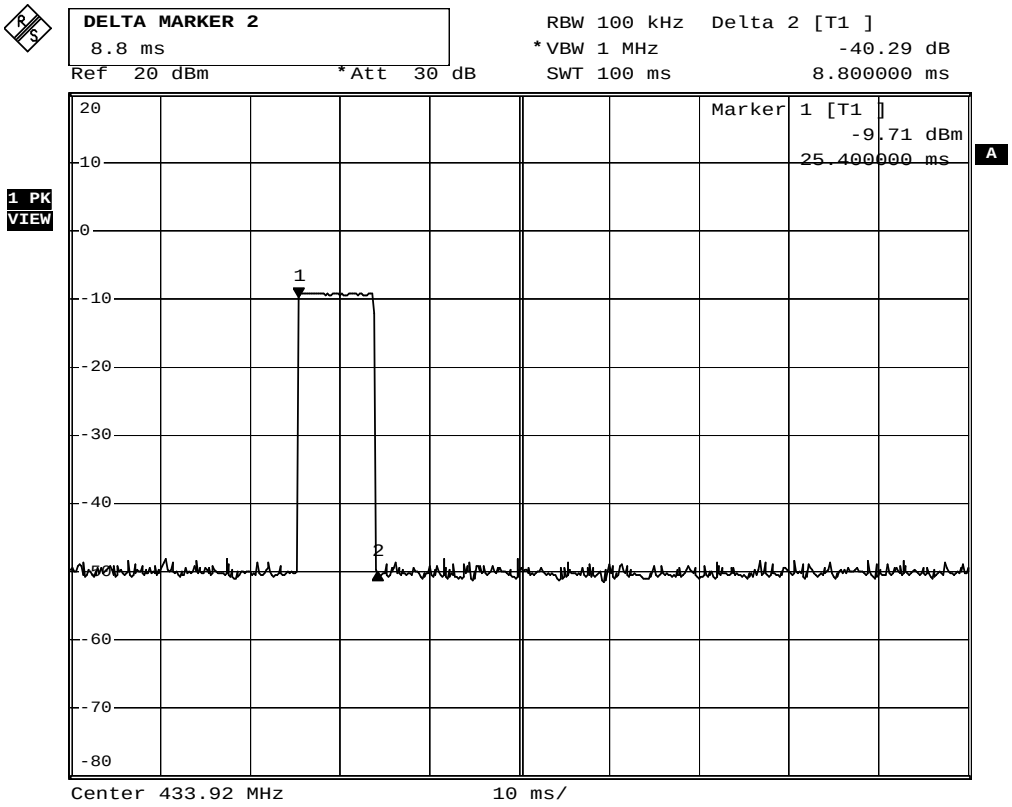
4.5. Uncertainty

± 25msec

4.6. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Duty Cycle		
Test Mode	Mode 1: Transmit		
Date of Test	2012/02/18	Test Site	SR7

Center Frequency	433.92 MHz
T_{ON} = 8.8ms T_{ON} +T_{Off} =100ms	
Duty Cycle==0.088*100%	8.8%



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5. Transmitter time

5.1. Test Equipment

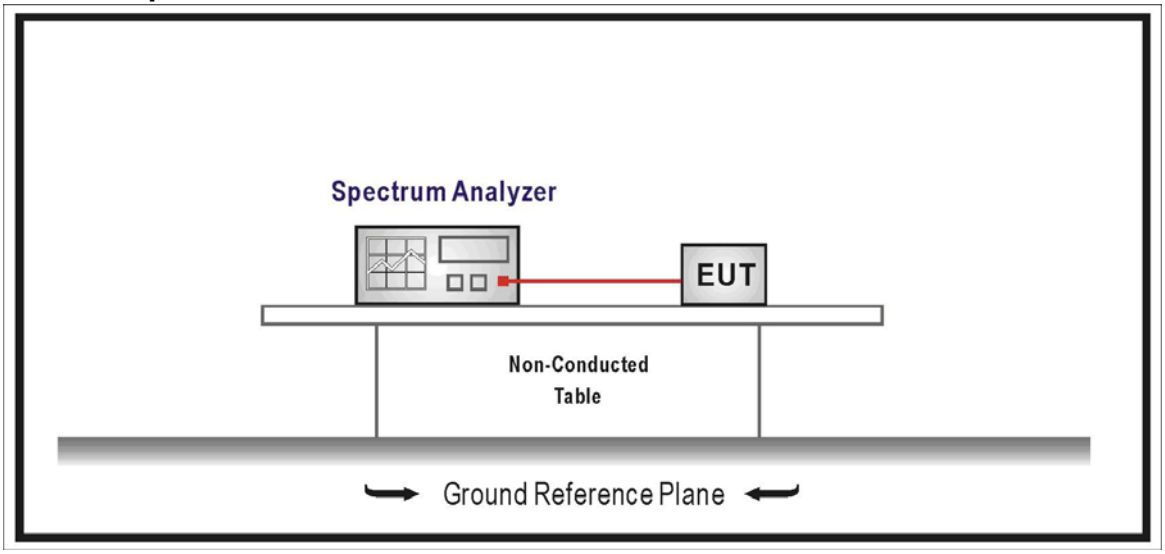
The following test equipments are used during the radiated emission tests:

Transmitter time / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

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

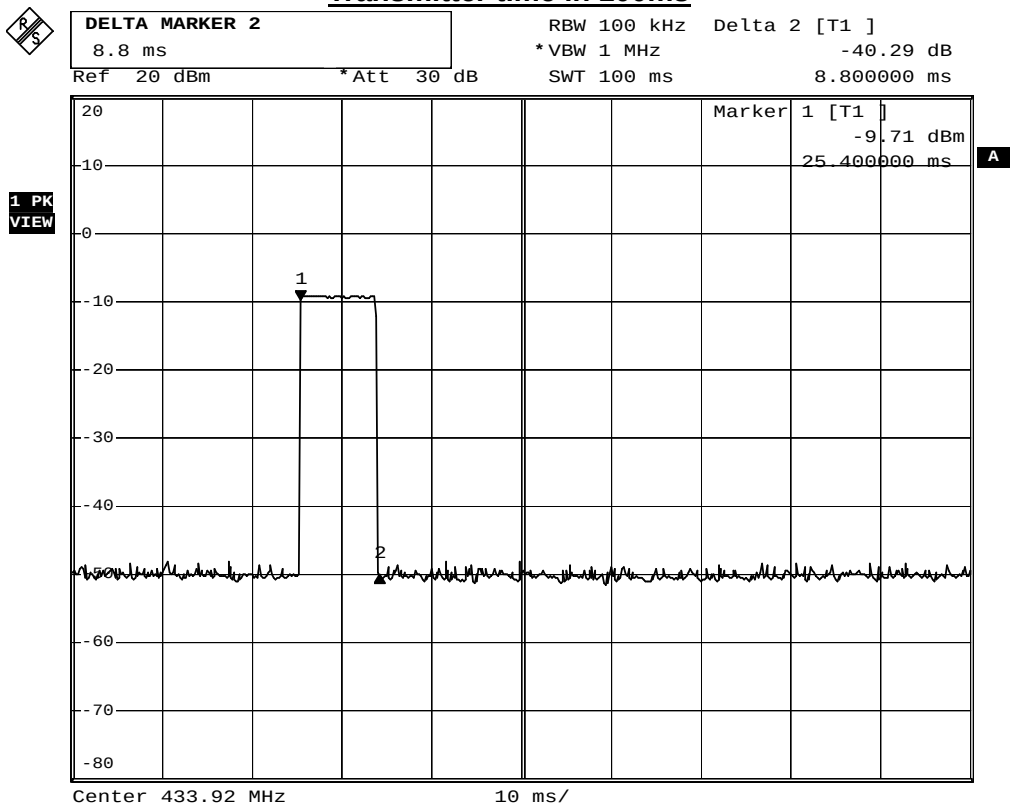
5.6. Test Result

Product	Tire Pressure Monitoring System		
Test Item	Transmitter time		
Test Mode	Mode 1: Transmit		
Date of Test	2012/02/18	Test Site	SR7

Frequency (MHz)	Transmitter time (ms.)		Silent period (sec.)	
	Measure value	Limit	Measure value	Limit
433.92	8.8	1000	30.40	10

Result	PASS

Transmitter time in 100ms



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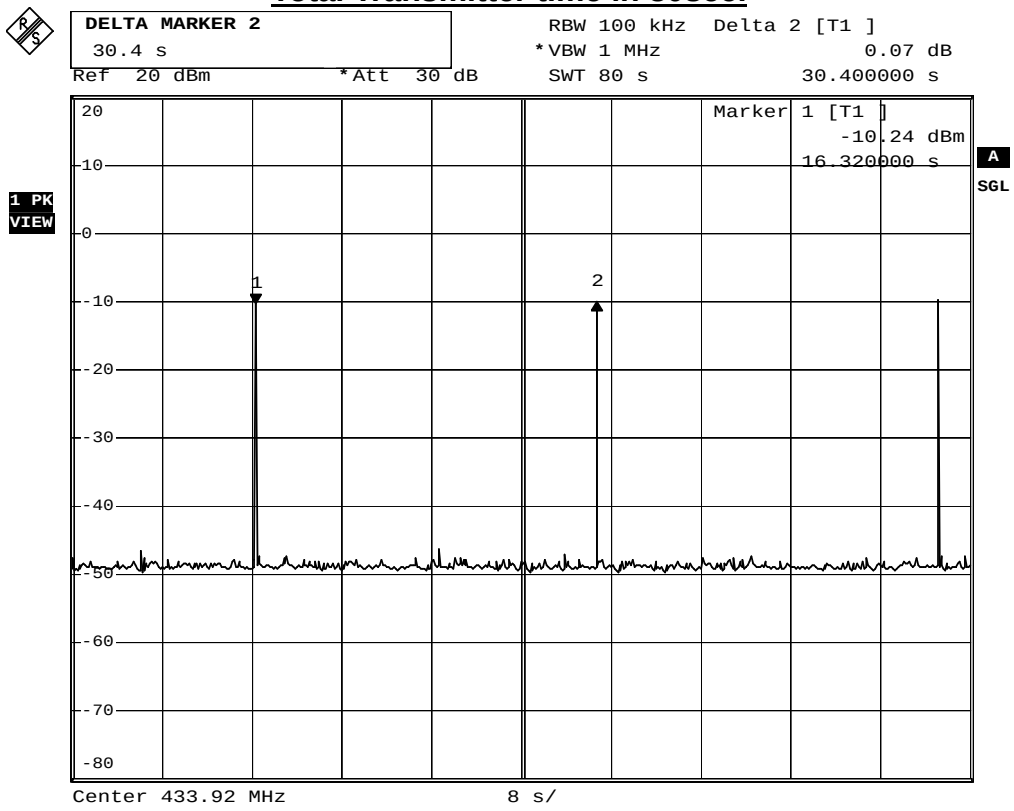
Total Transmitter time in 80sec.



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Date: 18.FEB.2012 15:06:37