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Report No.: SZEMO10030095901

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# FCC REPORT

**Application No.:** SZEMO100300959RF  
**Applicant:** Current Cost Ltd  
**Product Name:** The mini-sensor  
**Operation Frequency :** 433.932MHz  
**FCC ID:** WW9-MINI-SENSOR  
**Standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.231: 2008  
**Date of Receipt:** 03 March 2010  
**Date of Test:** 03 to 19 March 2010  
**Date of Issue:** 19 March 2010

<b>Test Result :</b>	<b>PASS *</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo  
Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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### 3 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Passed
Field strength of the fundamental signal	15.231 (e)	Passed
Spurious emissions	15.231 (e)/15.209	Passed
20dB Bandwidth	15.231 (c)	Passed
Transmit Time and Silent Period	15.231 (e)	Passed

*Remark: Passed: The EUT complies with the essential requirements in the standard.*

*Failed: The EUT does not comply with the essential requirements in the standard.*



## 4 General Information

### 4.1 Client Information

Applicant:	Current Cost Ltd
Manufacturer:	Current Cost Ltd
Address of Applicant:	Anglesey Lodge, Farnborough Road, Aldershot, Hampshire GU11 3BJ
Address of Manufacturer:	Anglesey Lodge, Farnborough Road, Aldershot, Hampshire GU11 3BJ

### 4.2 General Description of E.U.T.

Product Name:	The mini-sensor
Trade Name:	N/A
Item No.:	The mini-sensor
Operation Frequency:	433.932MHz
Modulation type:	FSK
Antenna Type:	Integral
Power supply:	DC Voltage: 2*1.5V (LR14 size "C") = 3.0V



#### 4.3 E.U.T Environments and test modes

<b>Operating Environment:</b>	
Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1008 mbar
<b>Test mode:</b>	
Transmitting mode	Keep the sensor unit transmit mode.



#### 4.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

**VCCI**

The 3m Semi-anechoic chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2197 and C-2383 respectively.

Date of Registration: September 29, 2008. Valid until September 28, 2011.

**FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 556682, June 27, 2008.

**Industry Canada (IC)**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1.

#### 4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch E&E Lab

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

#### 4.6 Other Information Requested by the Customer

None.

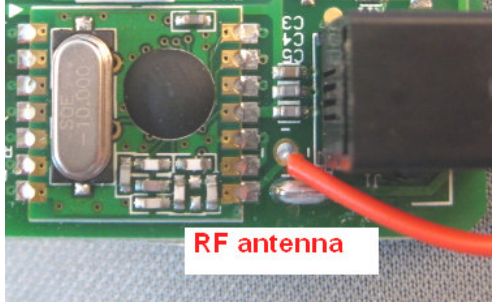
**4.7 Test Instruments list**

RE in Chamber						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	16-06-2009	15-06-2010
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	12-12-2009	11-12-2010
3	EMI Test software	AUDIX	E3	SEL0050	N/A	N/A
4	Coaxial cable	SGS	N/A	SEL0028	18-06-2009	17-06-2010
5	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0014	12-08-2009	11-08-2010
6	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0005	12-08-2009	11-08-2010
8	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	18-06-2009	17-06-2010
9	Pre-amplifier (1-18GHz)	Rohde & Schwarz	AFS42-00101 800-25-S-42	SEL0081	18-06-2009	17-06-2010

RF conducted						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	Spectrum Analyzer	Rohde & Schwarz	10336/030	EMC0040	16-06-2009	15-06-2010
2	Coaxial cable	SGS	N/A	SEL0028	18-06-2009	17-06-2010

## 5 Test results and Measurement Data

### 5.1 Antenna requirement:

<b>Standard requirement:</b>	FCC Part15 C Section 15.203
<p>15.203 requirement:  <i>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</i></p>	
<b>E.U.T Antenna:</b>	



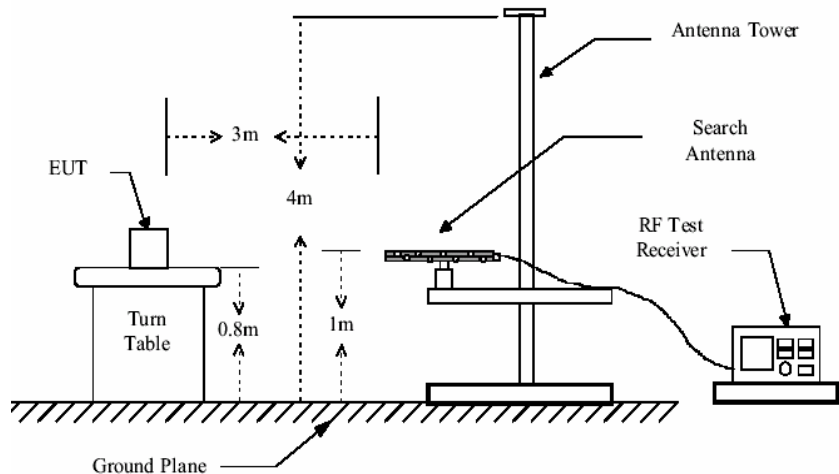


## 5.2 Radiated Emission

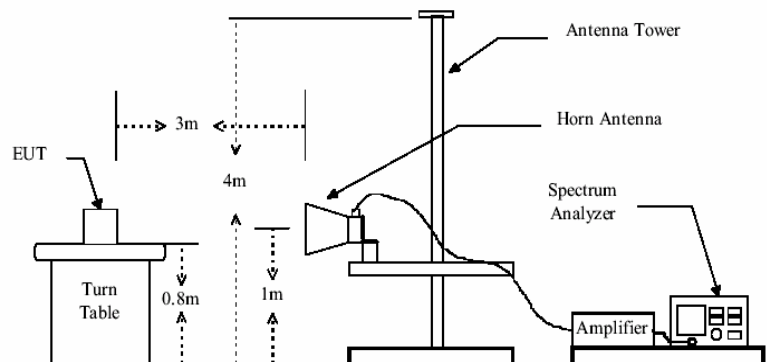
Test Requirement:	FCC Part15 C Section 15.231(e) and 15.209																							
Test Method:	ANSI C63.4: 2003																							
Test Frequency Range:	30MHz to 5000MHz																							
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)																							
Receiver setup:	<table><tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td></tr><tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td></tr><tr><td>Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td></tr></table>				Frequency	Detector	RBW	VBW	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Above 1GHz	Peak	1MHz	3MHz								
Frequency	Detector	RBW	VBW																					
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Limit: (Field strength of the fundamental signal)	<table><tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr><tr><td rowspan="2">433.932MHz</td><td>72.87</td><td>Average Value</td></tr><tr><td>92.87</td><td>Peak Value</td></tr></table>				Frequency	Limit (dBuV/m @3m)	Remark	433.932MHz	72.87	Average Value	92.87	Peak Value												
Frequency	Limit (dBuV/m @3m)	Remark																						
433.932MHz	72.87	Average Value																						
	92.87	Peak Value																						
Limit: (Spurious Emissions)	<table><tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr><tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr><tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr><tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr><tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr><tr><td>74.0</td><td>Peak Value</td></tr></table> <p>Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level Whichever limit permits a higher field strength.</p>				Frequency	Limit (dBuV/m @3m)	Remark	30MHz-88MHz	40.0	Quasi-peak Value	88MHz-216MHz	43.5	Quasi-peak Value	216MHz-960MHz	46.0	Quasi-peak Value	960MHz-1GHz	54.0	Quasi-peak Value	Above 1GHz	54.0	Average Value	74.0	Peak Value
Frequency	Limit (dBuV/m @3m)	Remark																						
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960MHz-1GHz	54.0	Quasi-peak Value																						
Above 1GHz	54.0	Average Value																						
	74.0	Peak Value																						
Test Procedure:	<p>1. The E.U.T and its simulators are placed on a turn table which is 0.8meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.</p> <p>2. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2003 on radiated measurement.</p> <p>3. Pre-scan the EUT is placed on X axis, Y axis, Z axis, and found the X axis which it is worse case.</p>																							
Test Instruments:	Refer to section 4.7 for details																							
Test mode:	Transmitting mode																							
Test results:	Passed																							

## Test setup:

### Below 1GHz



### Above 1GHz



## Note:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$



## Measurement Data

## 5.2.1 Field Strength Of The Fundamental Signal

## Peak value:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.932	2.35	16.62	27.38	82.57	74.16	92.87	-18.71	Vertical
433.932	2.35	16.62	27.38	78.31	69.90	92.87	-22.97	Horizontal

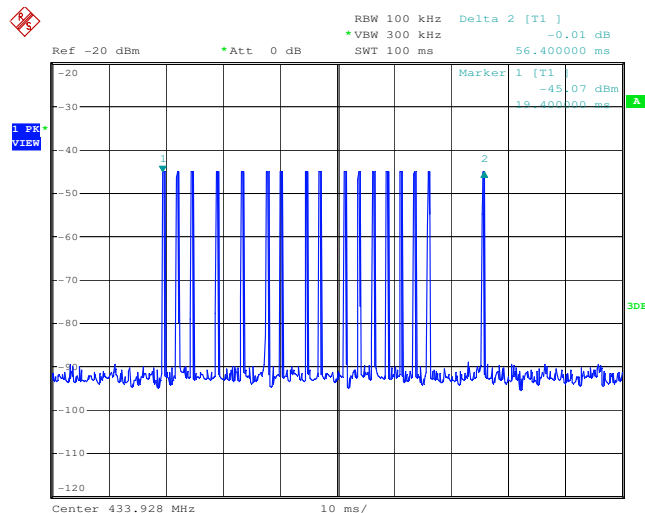
## Average value:

Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)=20 log0.0714= -22.93
	Duty cycle= T on time / T period =0.42ms*17/100ms=0.0714

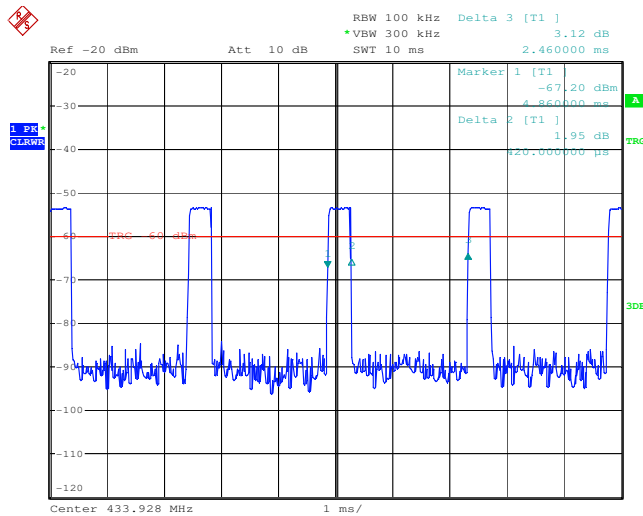
## Test data:

Frequency	Peak value	PDCF	Average Value	Limit (dBuV/m)	Polarization
433.932	69.90	-22.93	46.97	72.87	Horizontal
433.932	74.16	-22.93	51.23	72.87	Vertical

## Test plot as follows:



Date: 21.APR.2010 15:19:43



Date: 21.APR.2010 09:26:56

Remark:

Pre-scan transmit with all kind of current, and found the above plot which it is worse case.

**5.2.2 Spurious Emissions****30MHz~1GHz**

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamplifier Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
33.880	0.60	13.51	27.54	34.16	20.73	40.00	-19.27	Vertical
100.810	1.20	9.06	27.39	34.00	16.87	43.50	-26.63	Vertical
265.710	1.75	12.63	26.60	34.76	22.54	46.00	-23.46	Vertical
315.180	1.95	14.46	26.61	35.54	25.34	46.00	-20.66	Vertical
870.020	3.49	22.85	26.66	37.55	37.23	46.00	-8.77	Vertical
94.990	1.15	8.91	27.41	34.71	17.36	43.50	-26.14	Horizontal
226.910	1.56	11.56	26.73	34.94	21.33	46.00	-24.67	Horizontal
334.580	2.02	15.04	26.74	34.59	24.91	46.00	-21.09	Horizontal
566.410	2.67	19.03	27.51	35.58	29.77	46.00	-16.23	Horizontal
984.480	3.68	24.13	26.16	35.24	36.89	54.00	-17.11	Horizontal

**Above 1GHz**

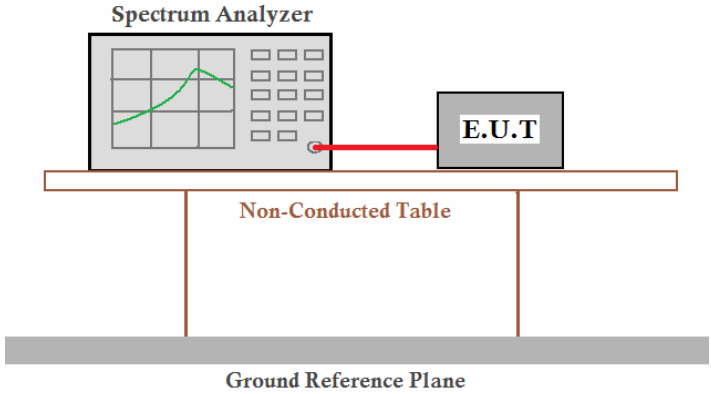
Peak average:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1301.78	4.52	26.53	39.41	53.67	45.31	74.00	-28.69	Vertical
1735.73	5.24	28.01	38.73	52.43	46.95	74.00	-27.05	Vertical
2169.66	5.64	28.47	38.81	50.68	45.98	74.00	-28.02	Vertical
2603.60	6.12	29.51	38.94	53.09	49.78	74.00	-24.22	Vertical
3037.52	6.37	30.08	39.05	54.16	51.56	74.00	-22.44	Vertical
1301.78	4.52	26.53	39.41	50.37	42.01	74.00	-31.99	Horizontal
1735.73	5.24	28.01	38.73	49.12	43.64	74.00	-30.36	Horizontal
2169.66	5.64	28.47	38.81	49.35	44.65	74.00	-29.35	Horizontal
2603.60	6.12	29.51	38.94	52.12	48.81	74.00	-25.19	Horizontal
3037.52	6.37	30.08	39.05	53.85	51.25	74.00	-22.75	Horizontal

Average value:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1301.78	4.52	26.53	39.41	41.28	32.92	54.00	-21.08	Vertical
1735.73	5.24	28.01	38.73	39.47	33.99	54.00	-20.01	Vertical
2169.66	5.64	28.47	38.81	40.21	35.51	54.00	-18.49	Vertical
2603.60	6.12	29.51	38.94	41.63	38.32	54.00	-15.68	Vertical
3037.52	6.37	30.08	39.05	42.08	39.48	54.00	-14.52	Vertical
1301.78	4.52	26.53	39.41	40.54	32.18	54.00	-21.82	Horizontal
1735.73	5.24	28.01	38.73	40.67	35.19	54.00	-18.81	Horizontal
2169.66	5.64	28.47	38.81	39.58	34.88	54.00	-19.12	Horizontal
2603.60	6.12	29.51	38.94	41.34	38.03	54.00	-15.97	Horizontal
3037.52	6.37	30.08	39.05	42.53	39.93	54.00	-14.07	Horizontal

### 5.3 20dB Bandwidth

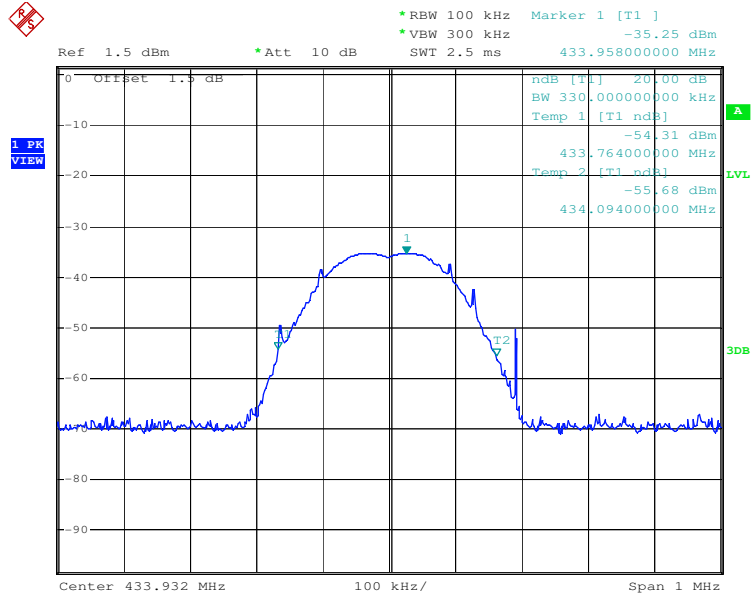
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.4:2003
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test Procedure:	<ol style="list-style-type: none"> <li>1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.</li> <li>2. Set the EUT to proper test channel.</li> <li>3. Max hold the radiated emissions, mark the peak power frequency point and the -20dB upper and lower frequency points.</li> <li>4. Read 20dB bandwidth.</li> </ol>
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 4.7 for details
Test mode:	Transmitting mode
Test results:	Passed

#### Measurement Data

20dB bandwidth (KHz)	Limit (KHz)	Results
330	1085	Pass



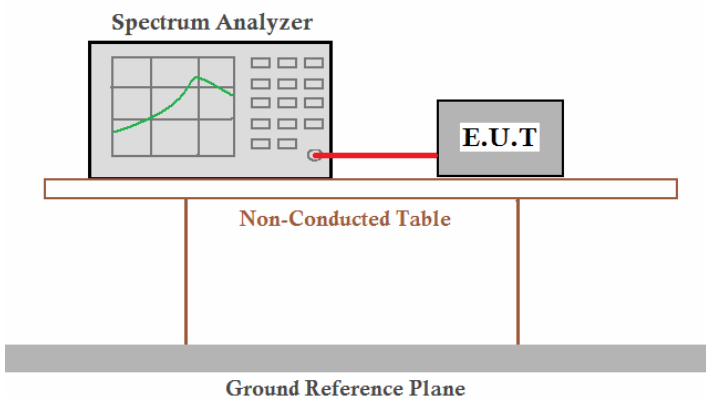
Test plot as follows:



Date: 16.MAR.2010 16:27:45



## 5.4 Transmit Time and Silent Period:

Test Requirement:	FCC Part15 C Section 15.231 (e)
Test Method:	ANSI C63.4:2003
Limit:	The duration of each transmission shall not be greater than one second The silent period shall be at least 30 times the transmit time but in no case less than 10 seconds.
Test Procedure:	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set the EUT to proper test channel. 3. Single scan the transmitter, and read the transmission time.
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two vertical legs and sits on a Ground Reference Plane.</p>
Test Instruments:	Refer to section 4.7 for details
Test mode:	Transmitting mode
Test results:	Passed

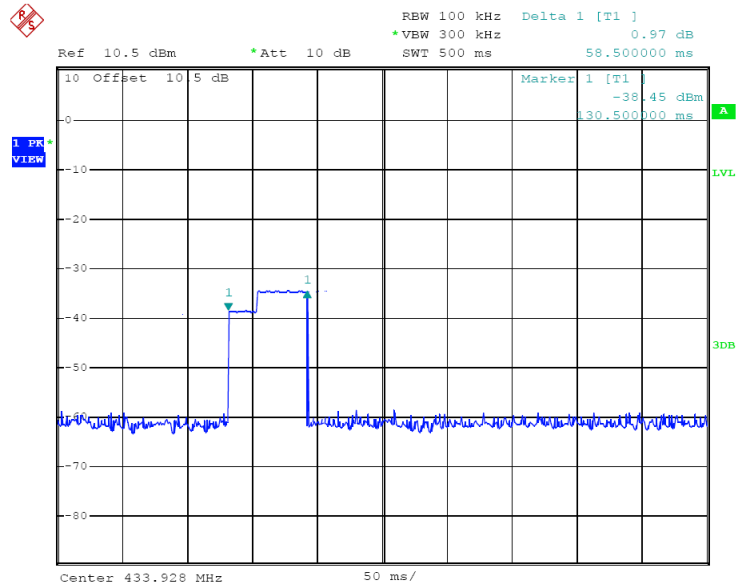
## Measurement Data

Test item	Test data	Limit (second)	Result
Transmitting time	58.50ms	1	Pass
Silent Period	12.06s	10	Pass

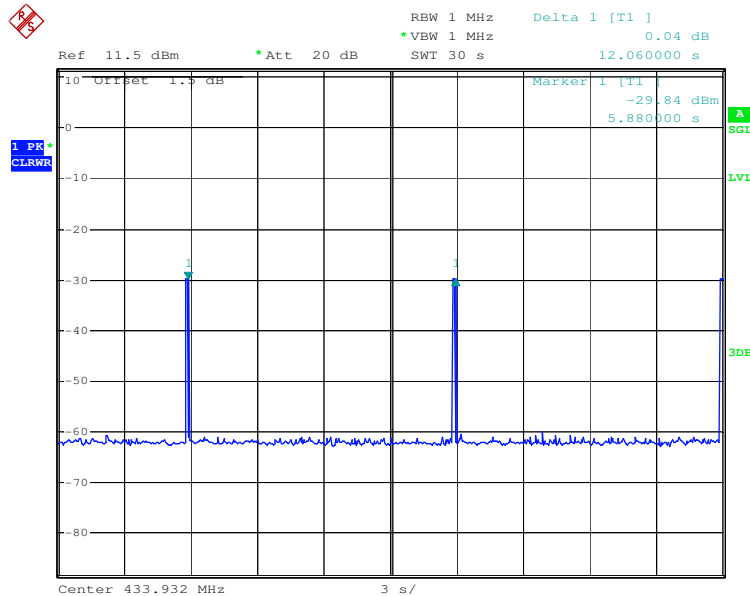


Test plot as follows:

Transmitting time:



Silent Period:



Date: 16.MAR.2010 16:10:13