

FCC PART 15.231 MEASUREMENT AND TEST REPORT FOR

GUANGDONG STEELMATE SECURITY CO., LTD.

Renan Street, Dongfu Road, Dongfeng Town, Zhongshan, 528425, China

FCC ID: Q6WTP123

Report Concerns: Original Report	Equipment Type: Tire Pressure Monitoring System
Model:	<u>TP-01</u>
Report No.:	<u>STR10078171I</u>
Test Date:	<u>2010-08-10 to 2010-08-24</u>
Issue Date:	<u>2010-08-26</u>
Test Engineer:	<u>Seven Song</u> <i>Seven Song</i>
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Prepared By:	
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Applicant: GUANGDONG STEELMATE SECURITY CO., LTD.
 Address of applicant: Renan Street, Dongfu Road, Dongfeng Town, Zhongshan, 528425, China

Manufacturer: GUANGDONG STEELMATE SECURITY CO., LTD.
 Address of manufacturer: Renan Street, Dongfu Road, Dongfeng Town, Zhongshan, 528425, China

General Description of E.U.T

Items	Description
EUT Description:	Tire Pressure Monitoring System
Trade Name:	Steel mate
Model No.:	TP-01
Adding Model:	TP-02, TP-03
Rated Voltage:	DC 2.2-3.8V
Output Power:	<1mW
Frequency Range:	433.92 MHz
Antenna Type:	Integral Antenna
Size:	7.6X6.0X2.2 cm
Comment:	Periodic Operation Device
For more information refer to the circuit diagram form and the user’s manual.	

The test data is gathered from a production sample, provided by the manufacturer, the other models listed in the report have different appearance only of TP-01 without circuit and electronic construction changed, declared by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the GUANGDONG STEELMATE SECURITY CO., LTD. in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

1.3 Related Submittal(s)/Grant(s)

No Related Submittal(s).

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions. The EUT was tested in all three orthogonal planes and the worse case was showed.

1.5 Test Facility

- **FCC – Registration No.: 994117**
 SEM.Test Compliance Services Co., Ltd. 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 and the Registration is 994117.
- **Industry Canada (IC) Registration No.: 7673A**
 The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software, provided by the customer, is started while the whole system is running.

1.7 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

1.8 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.203 Antenna Requirement	Compliant
§15.205 Restricted Band	Compliant
§15.207 Conducted Emission	N/A
§15.209 General Requirement	Compliant
§15.231 (e) Deactivation Testing	Compliant
§15.231 (c) 20dB Band Width Testing	Compliant
§15.231 (e) Radiated Emission	Compliant

3. §15.203 ANTENNA REQUIREMENT

3.1 Standard Applicable

According to FCC 15.203, 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 shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an Integral antenna, fulfill the requirement of this section.

4. §15.205, §15.209, §15.231 (e) RADIATED EMISSION

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

4.2 Standard Applicable

According to §15.231(e), 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)
40.66-40.70.....	1000.....	100
70-130.....	500.....	50
130-174.....	\1\ 500 to 1500	\1\ 50 to 150
174-260.....	1500.....	150
260-470.....	\1\ 1500 to.....	\1\ 150 to 500
	5000	
Above 470.....	5000.....	500

\1\ Linear interpolations.

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

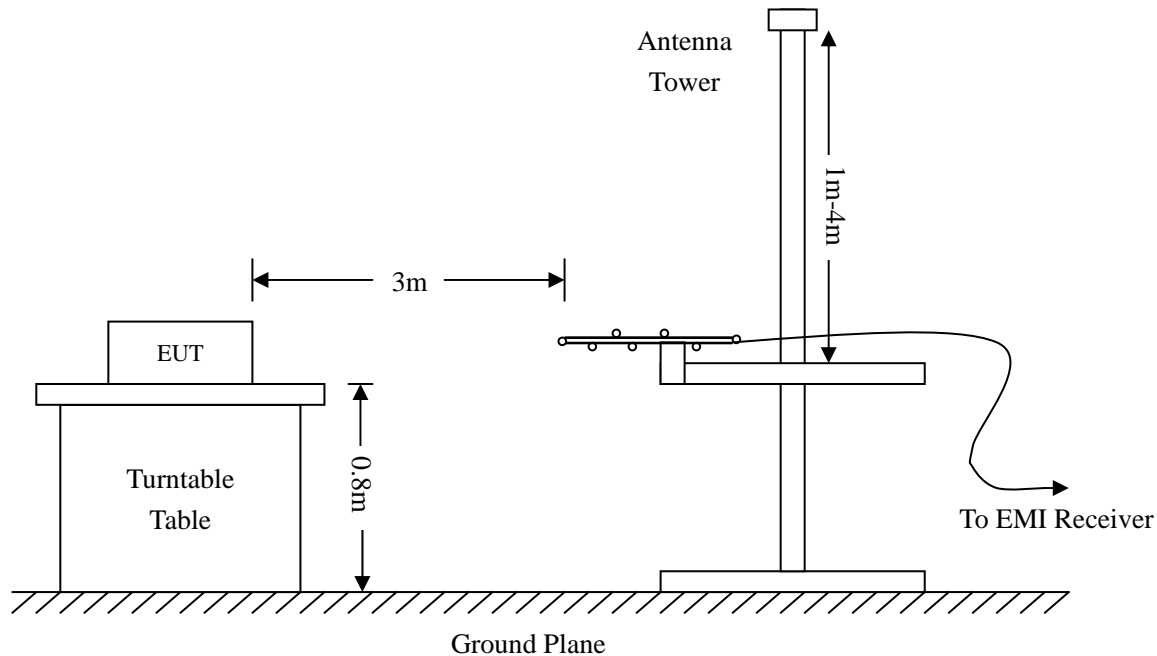
4.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-04-16	2011-04-15
EMI Test Receiver	R&S	ESVB	825471/005	2010-08-12	2011-08-11
Positioning Controller	C&C	CC-C-1F	N/A	2010-08-12	2011-08-11
RF Switch	EM	EMSW18	SW060023	2010-08-12	2011-08-11
Pre-amplifier	Agilent	8447F	3113A06717	2010-08-12	2011-08-11
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-08-12	2011-08-11
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2010-07-21	2011-07-20
Horn Antenna	ETS	3117	00086197	2010-07-21	2011-07-20

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.



4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Loss} + \text{Cab. Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.231 Limit}$$

4.6 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53 %
ATM Pressure:	1011 mbar

4.7 Summary of Test Results/Plots

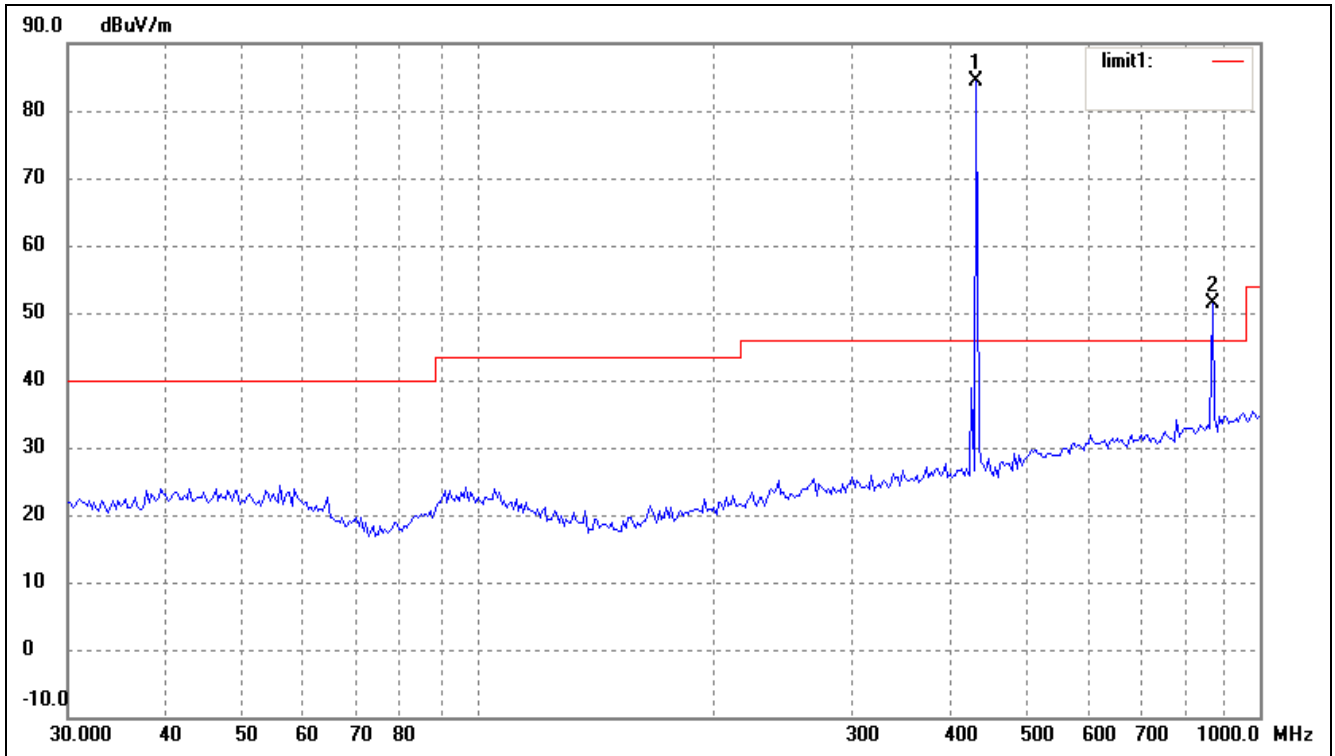
According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

-11.63 dBμV at 434.10 MHz in the Vertical polarization, (Ave) 30 MHz to 5 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

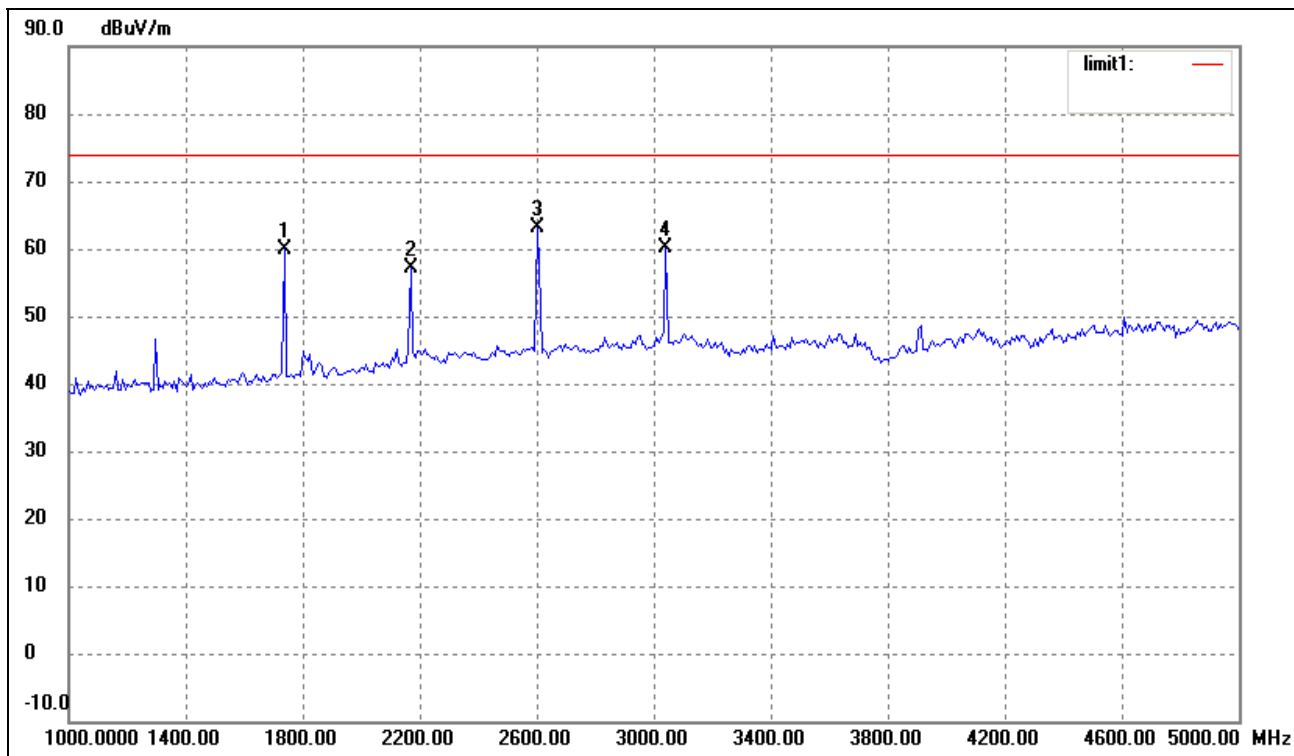
Plot of Radiation Emissions Test (Below 1 G)

Horizontal



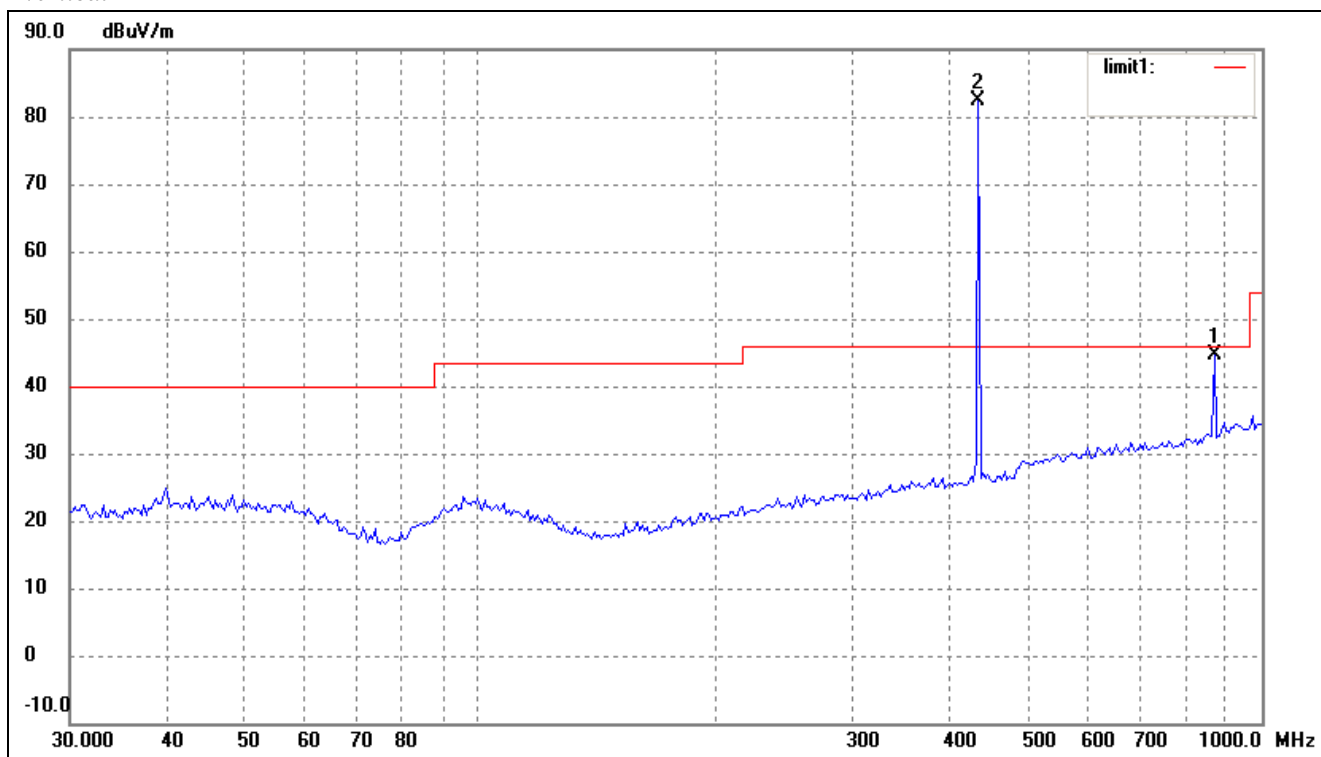
No.	Frequency MHz	Reading dBuV/m	Corr. Factor(dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	433.9154	72.96	10.56	N/A	83.52	92.87	-9.35	335	100	peak
2	867.8312	34.97	16.47	N/A	51.44	72.87	-21.43	174	100	peak
	433.9154	/	/	-10.90	72.62	72.87	-0.25	/	/	Ave
	867.8312	/	/	-10.90	40.54	52.87	-12.33	/	/	Ave

Above 1GHz



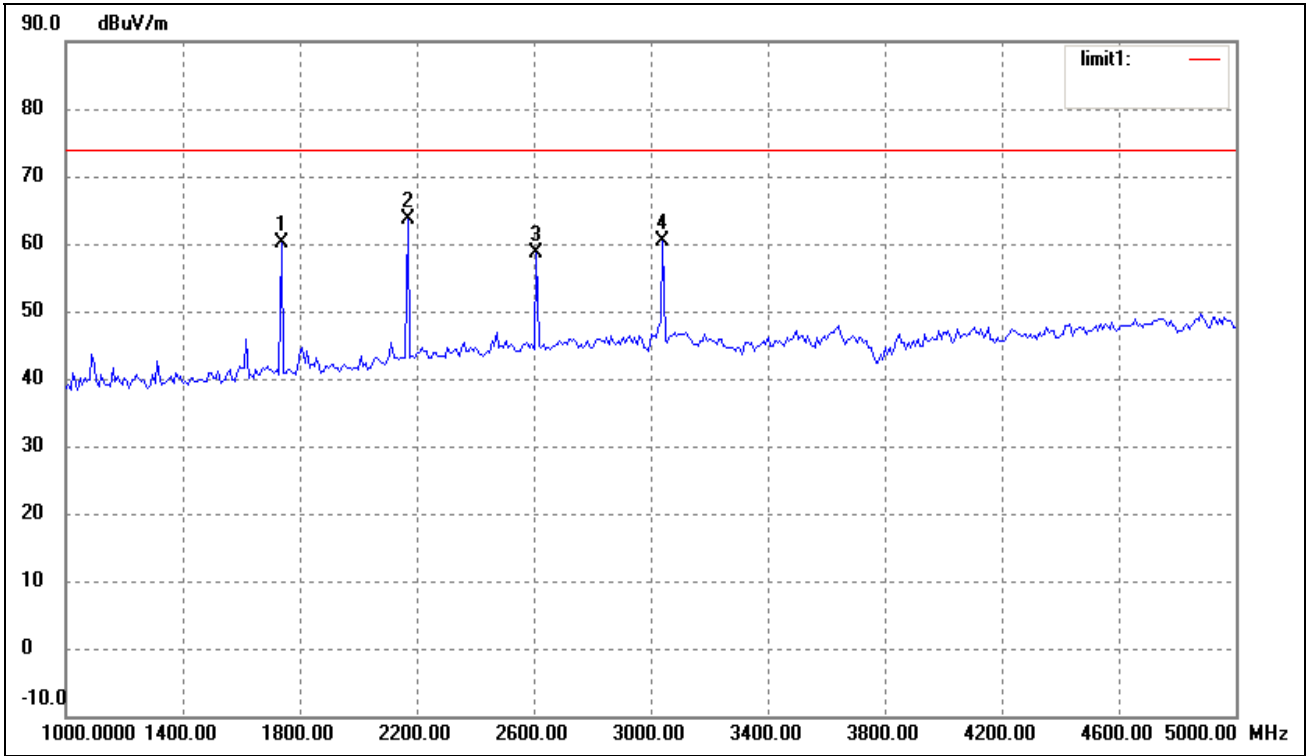
No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin dB	Deg. (°)	Height (cm)	Remark
1	1736.000	66.89	-7.09	/	59.80	74.00	-14.20	145	100	Peak
2	2170.000	62.03	-5.01	/	57.02	74.00	-16.98	310	100	Peak
3	2603.000	67.39	-4.15	/	63.24	74.00	-10.76	117	100	Peak
4	3037.000	63.54	-3.49	/	60.05	74.00	-13.95	214	100	Peak
	1736.000	/	/	-10.9	48.90	54.00	-5.10	/	/	Ave
	2170.000	/	/	-10.9	46.12	54.00	-7.88	/	/	Ave
	2603.000	/	/	-10.9	52.34	54.00	-1.66	/	/	Ave
	3037.000	/	/	-10.9	49.15	54.00	-4.85	/	/	Ave

Vertical



No.	Frequency MHz	Reading dBuV/m	Corr. Factor(dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	867.8312	28.06	16.47	N/A	44.53	72.87	-28.34	360	100	peak
2	433.9154	71.77	10.56	N/A	82.33	92.87	-10.54	230	100	peak
	867.8312	/	/	-10.90	33.63	52.87	-19.24	/	/	Ave
	433.9154	/	/	-10.90	71.43	72.87	-1.44	/	/	Ave

Above 1GHz



No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin dB	Deg. (°)	Height (cm)	Remark
1	1736.000	67.24	-7.09	/	60.15	74.00	-13.85	45	100	Peak
2	2170.000	68.74	-5.01	/	63.73	74.00	-10.27	310	100	Peak
3	2603.000	62.74	-4.14	/	58.60	74.00	-15.40	360	100	Peak
4	3037.000	63.94	-3.49	/	60.45	74.00	-13.55	261	100	Peak
	1736.000	/	/	-10.9	49.25	54.00	-4.75	/	/	Ave
	2170.000	/	/	-10.9	52.83	54.00	-1.17	/	/	Ave
	2603.000	/	/	-10.9	47.70	54.00	-6.30	/	/	Ave
	3037.000	/	/	-10.9	49.55	54.00	-4.45	/	/	Ave

5. §15.231(c) 20dB BANDWIDTH TESTING

5.1 Standard Applicable

According to FCC 15.231(c), 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.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2009-08-12	2010-08-11
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.3 Test Procedure

With the EUT’s antenna attached, the EUT’s 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT’s operation band.

5.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

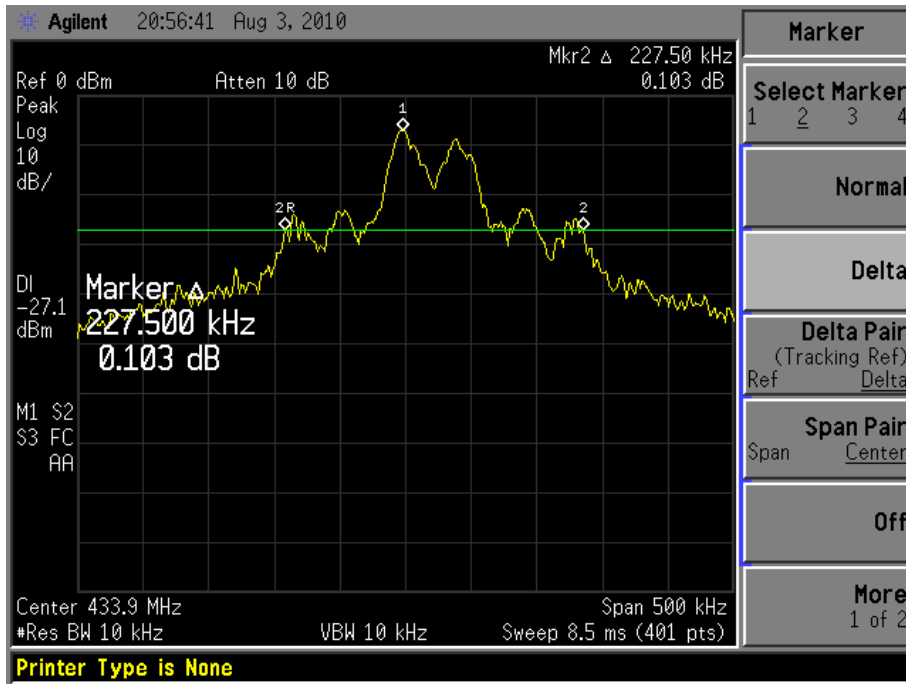
5.5 Summary of Test Results/Plots

Frequency MHz	20dB Bandwidth KHz	Limit kHz
433.92	227.5	1084.8

Limit=Frequency×0.25%=433.92×0.25%=1084.8 kHz

Test Result Pass

Refer to the attached plots.



6. §15.231(e) DEACTIVATION TESTING

6.1 Standard Applicable

According to FCC 15.231 (e) devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that 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.

According to FCC 15.231 a (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2009-08-12	2010-08-11
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

With the EUT’s antenna attached, the EUT’s output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 434.10MHz, than set the spectrum analyzer to Zero Span for the release time reading.

6.4 Environmental Conditions

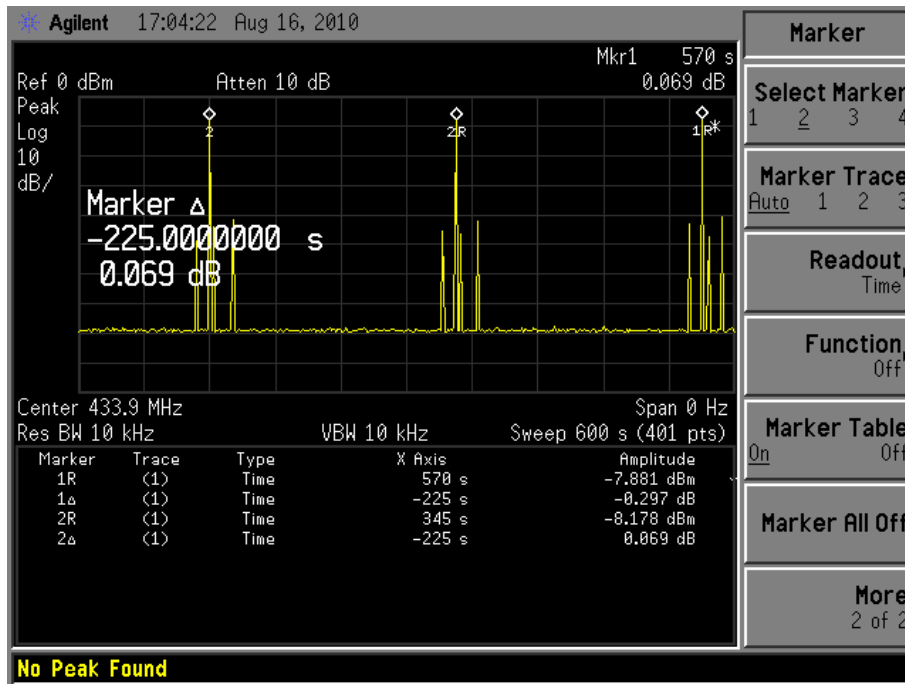
Temperature:	26 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

6.5 Summary of Test Results/Plots

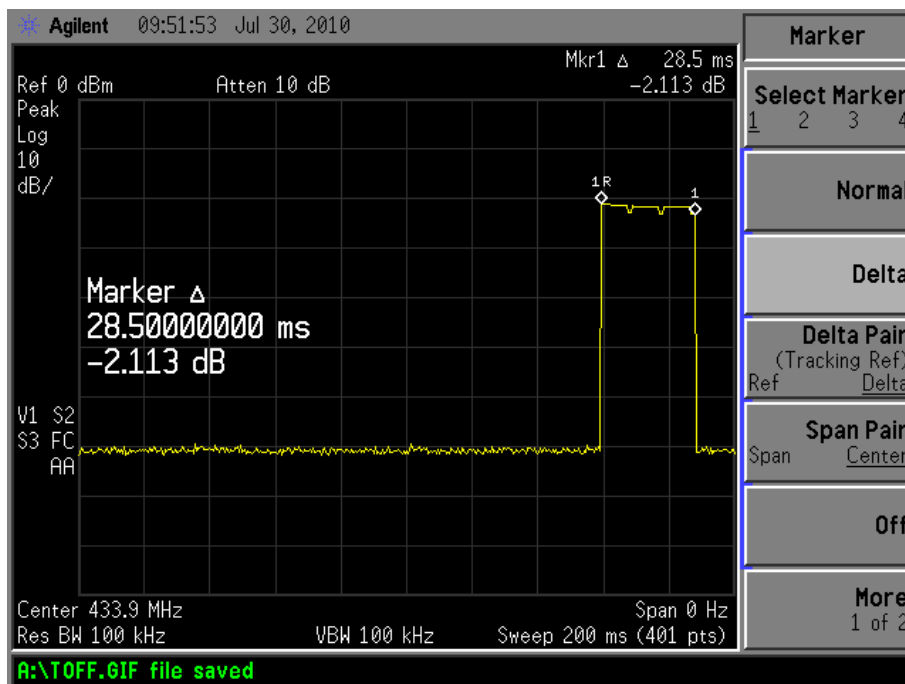
Refer to the attached plots.

Normal Transmitting Under Standby

Silent Time = 225s > 10s and exceed 30times transmission time



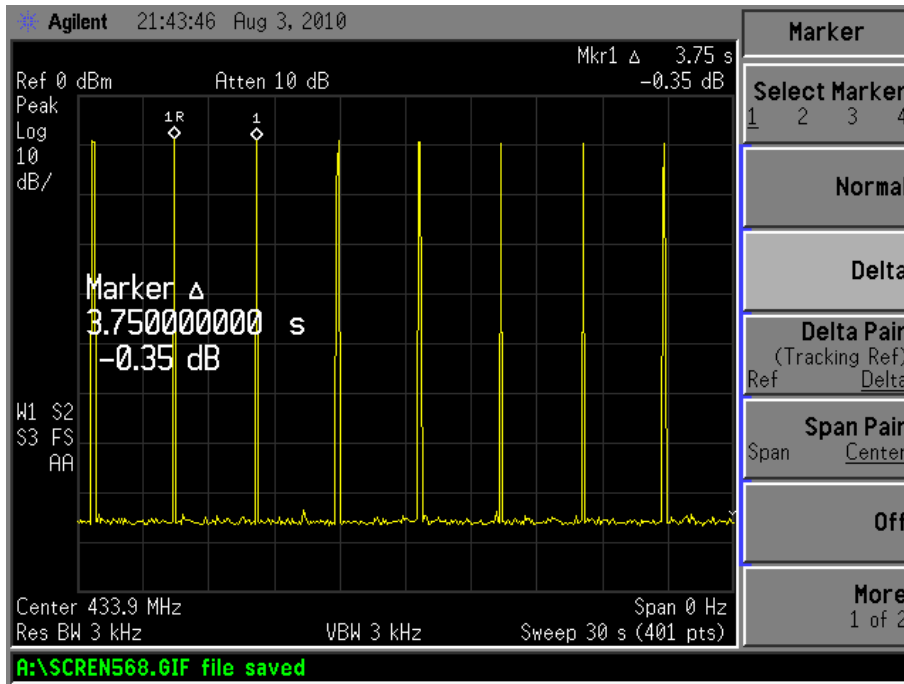
Transmission Time = 0.0285s < 1s



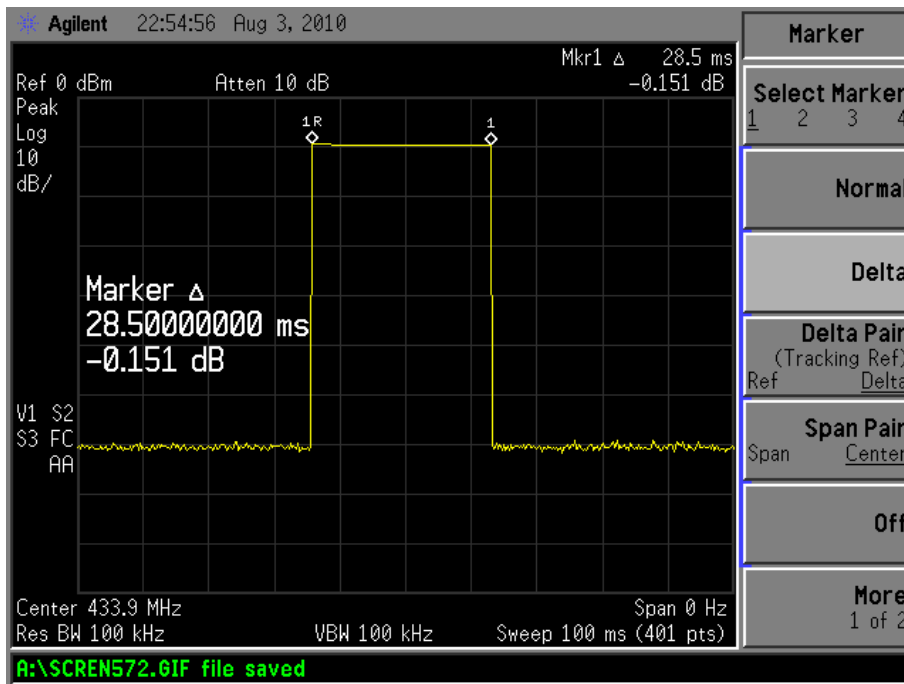
Result: Pass

Alarm Transmitting Under Slowly Leak

Silent Time = $3.75 - 0.0285 = 3.7215$ s

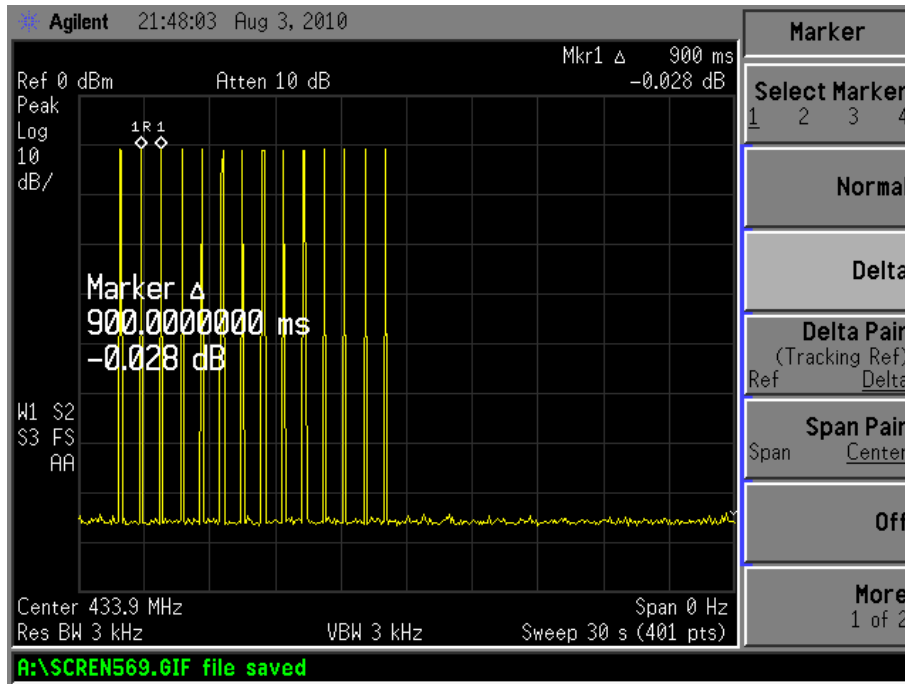


Transmission Time = 0.0285s

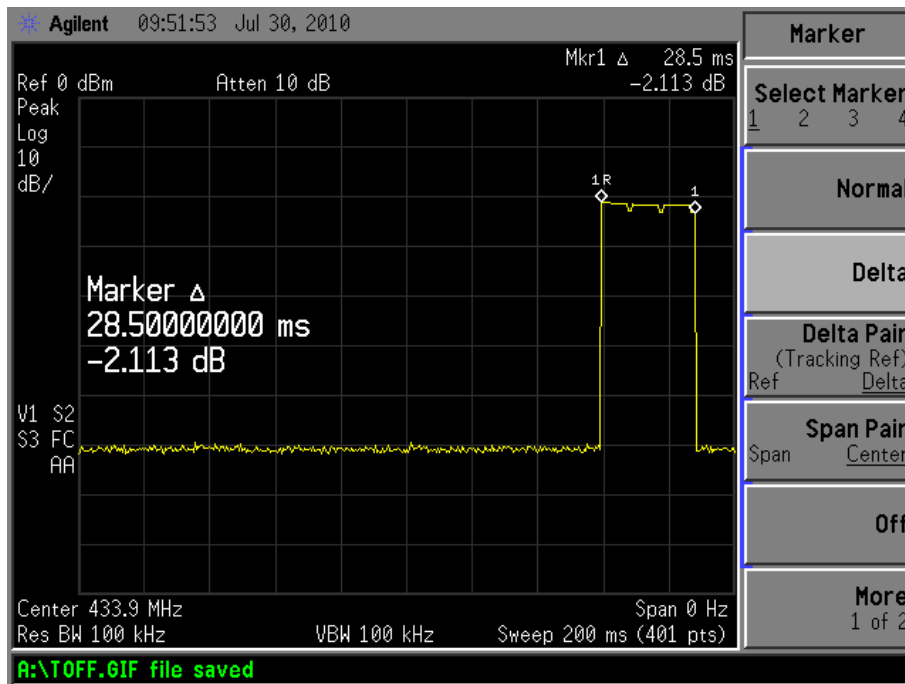


Alarm Transmitting Under Quickly Leak

Silent Time = $0.9 - 0.0285 = 0.8715$ s



Transmission Time = 0.0285s



According to FCC 15.231 a (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition, So the device comply with the requirement of the section for alarm transmitting test mode.

7. §15.231(b) Duty Cycle

7.1 Standard Applicable

According to FCC 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2009-08-12	2010-08-11
Attenuator	ATTEN	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.3 Test Procedure

With the EUT’s antenna attached, the EUT’s output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.94MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

7.4 Environmental Conditions

Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

7.5 Summary of Test Results/Plots

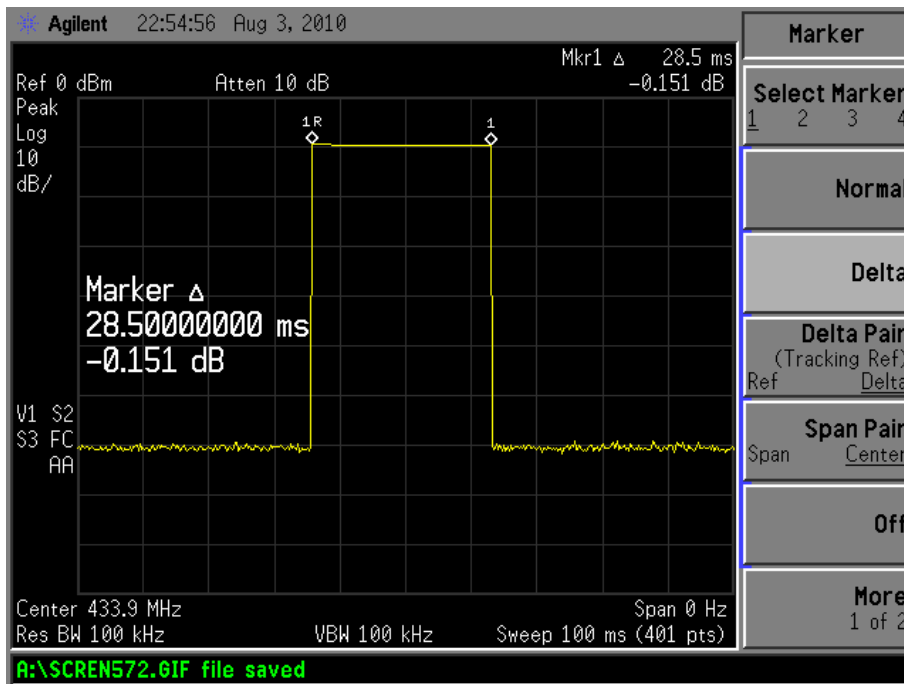
$T_{p1} = 225 \text{ s} > 100\text{ms}$, $T_p = 100\text{ms}$

$T_{on} = T_{on1} * \text{Number} + T_{on2} * \text{Number} = 28.5 \text{ ms}$

$\text{Duty Cycle} = T_{on} / T_p * 100\% = 28.5\%$

$\text{Factor} = 20 * \text{Log} (T_{on}/T_p) = 10.90$

Refer to the attached plots.



***** END OF REPORT *****