

FCC PART 15.231


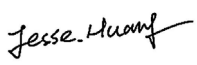
## TEST REPORT

For

**Hangzhou Hamaton Tyre Valves Co., Ltd.**

12 East Zhenxing Road, Linping, Yuhang, Hangzhou, China

**FCC ID : Z27HTS2A315**

<b>Report Type:</b> CIIPC	<b>Product Type:</b> TPMS Sensor
<b>Test Engineer:</b> Matt Yao	
<b>Report Number:</b> RKS160229001-00G	
<b>Report Date:</b> 2017-02-17	
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>4</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	4
OBJECTIVE .....	4
RELATED SUBMITTAL(S)/GRANT(S) .....	4
TEST METHODOLOGY .....	4
TEST FACILITY .....	5
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>6</b>
JUSTIFICATION .....	6
EUT EXERCISE SOFTWARE .....	6
EQUIPMENT MODIFICATIONS .....	6
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>8</b>
APPLICABLE STANDARD .....	8
ANTENNA CONNECTED CONSTRUCTION .....	8
<b>FCC §15.205, §15.209, §15.231 (E) - RADIATED EMISSIONS TEST .....</b>	<b>9</b>
APPLICABLE STANDARD .....	9
MEASUREMENT UNCERTAINTY .....	9
EUT SETUP .....	9
EMI TEST RECEIVER SETUP .....	11
TEST EQUIPMENT LIST AND DETAILS .....	11
TEST PROCEDURE .....	11
APPLICABLE STANDARD .....	12
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	12
TEST RESULTS SUMMARY .....	13
TEST DATA .....	13
<b>FCC §15.231(C) – 20 DB BANDWIDTH TESTING.....</b>	<b>18</b>
REQUIREMENT .....	18
TEST EQUIPMENT LIST AND DETAILS .....	18
TEST PROCEDURE .....	18
TEST DATA .....	18
<b>FCC §15.231(E) - DEACTIVATION TESTING .....</b>	<b>21</b>
APPLICABLE STANDARD .....	21
EUT SETUP .....	21
TEST EQUIPMENT LIST AND DETAILS .....	22
TEST DATA .....	22
<b>DECLARATION LETTER.....</b>	<b>26</b>

**DOCUMENT REVISION HISTORY**

Revision Number	Report Number	Description of Revision	Date of Revision
0	RKS160229001-00G	Initial	2016-03-11
1	RKS160229001-00G	Corrected and replaced invalid plot & table on P23 & P24	2017-02-17

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The Hangzhou Hamaton Tyre Valves Co., Ltd.'s product, model number: DVT-1001H, 97356 (FCC ID: Z27HTS2A315) the "EUT" is a TPMS Sensor, The EUT was measured approximately: 65 mm(L)\*55 mm(W)\* 15mm(H). Rated input voltage: DC 3V from battery.

*Note: The product's series model number: JDI-1001H, 97357. The differences please refer to the product similarity declaration letter.*

*\*All measurement and test data in this report was gathered from production sample serial number: 20160303009 (Assigned by BACL Kunshan). The EUT supplied by the applicant was received on 2016-03-03*

### Objective

This document is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.10 – 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

This is the CIIPC application of the device. The difference between the original device and the current one is as follows:

1. Add new models (Model: DVT-1001H, 97356, JDI-1001H, 97357).
2. The original inductance of sensor was produced by Premo Group and the model: SDTR1103. The new inductance of sensor was produced by TDK and the model: TPL802727-722H

For the changes made to the device, all the test items were performed.

### Related Submittal(s)/Grant(s)

No Related Submittals.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10 - 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement at antenna port.

## **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10 - 2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured in testing mode which was provided by manufacturer.

### EUT Exercise Software

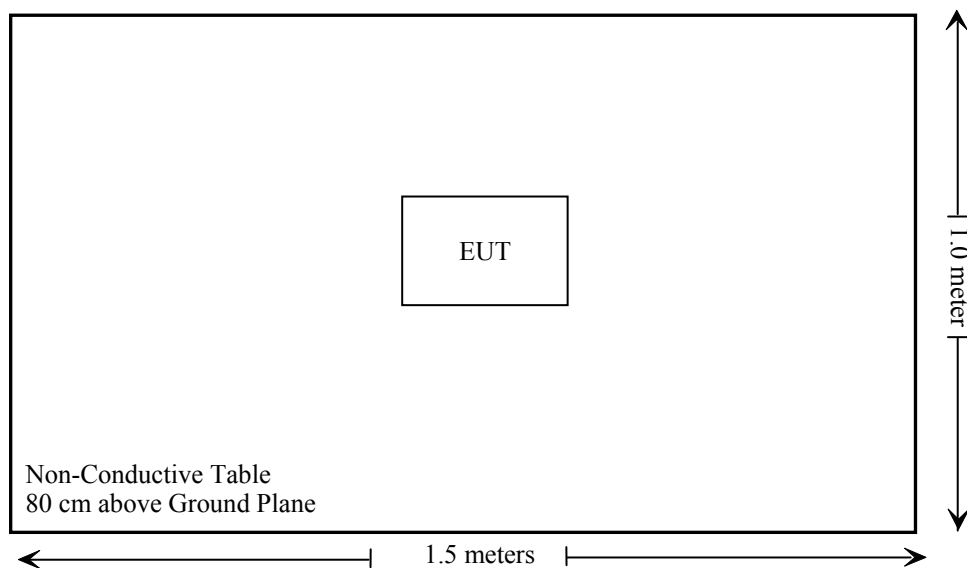
No exercise software.

### Equipment Modifications

No modification on the EUT.

### Block Diagram of Test Setup

Below 1GHz:



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**SUMMARY OF TEST RESULTS**

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FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emission	Not applicable*
§ 15.205, §15.209, §15.231 (e)	Radiated Emission Test	Compliance
§ 15.231 (c)	20dB Bandwidth Testing	Compliance
§ 15.231 (e)	Deactivation Testing	Compliance

Not applicable\*: The EUT is powered by battery only.

**FCC §15.203 - ANTENNA REQUIREMENT**

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**Applicable Standard**

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.

**Antenna Connected Construction**

The EUT has an internal antenna welded on the PCB and the antenna gain is 2dBi, which complied with 15.203. Please refer to the EUT Internal photos.



## FCC §15.205, §15.209, §15.231 (e) - RADIATED EMISSIONS TEST

### Applicable Standard

FCC §15.205, §15.209, §15.231 (e)

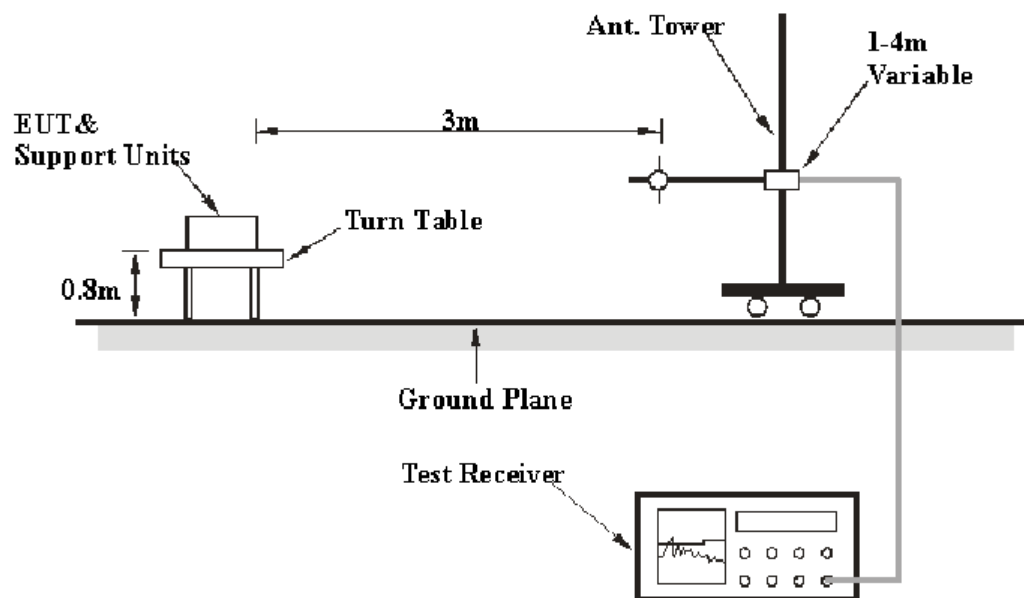
### Measurement Uncertainty

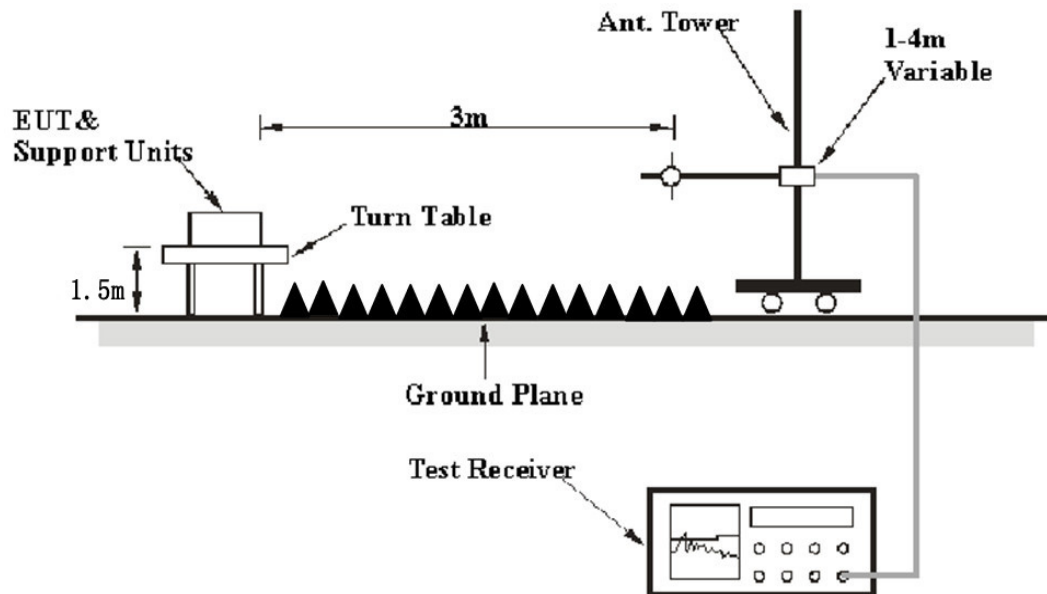
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is 5.91 dB for 30MHz-1GHz and 4.92 dB for above 1GHz, 1.95dB for conducted measurement at antenna port. And the uncertainty will not be taken into consideration for the test data recorded in the report

### EUT Setup

Below 1 GHz:



**Above 1 GHz:**

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10 - 2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

## EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz – 1000MHz	100 kHz	300 kHz	100kHz	QP
1000 MHz – 5000 MHz	1MHz	3MHz	/	PK

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	Amplifier	330	171377	2015-09-16	2016-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2015-09-12	2016-09-12
ETS	Horn Antenna	3115	6229	2015-11-07	2016-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
Mini	Pre-amplifier	ZVA-183-S+	857001418	2015-09-16	2016-09-16
champrotek	Chamber	Chamber A	1#	2015-09-17	2016-09-17
R&S	Auto test Software	EMC32	V 09.10.0	-	-
BACL	RF cable	KS-LAB-A01	KS-LAB-A01	2015-06-16	2016-12-15
BACL	RF cable	KS-LAB-A02	KS-LAB-A02	2015-06-16	2016-12-15

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

According to §15.231, Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

### Applicable Standard

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 emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000 *	150 to 500*
Above 470	5,000	500

\*Linear interpolations.

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

### Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the CFR47 §15.205, §15.209, § 15.231 (e), with the worst margin reading of:

**0.25dB at 315 MHz in the Horizontal polarization**

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(L_m)} \leq L_{lim} + U_{cispr}$$

In BACL,  $U_{(L_m)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

*The testing was performed by Matt Yao on 2016-03-07  
Test mode: Transmitting*

### Field Strength (Peak)

Frequency (MHz)	Maximum Reading (dBuV)	RX Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	15.231(e)	
		Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
315	77.30	V	13.70	1.20	25.20	67.00	87.66	20.66
315	90.80	H	13.70	1.20	25.20	80.50	87.66	7.16
630	54.50	H	18.50	1.80	25.20	49.60	67.66	18.06
630	50.20	V	18.50	1.80	25.20	47.30	67.66	20.36
945	58.10	H	22.40	2.40	25.30	57.60	67.66	10.06
945	57.20	V	22.40	2.40	25.30	56.70	67.66	10.96

## Field Strength (Average)

Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Antenna Polarity (H/V)	Duty Cycle Correction Factor (dB)	Average Amp. (dBμV/m)	15.231(e)	
					Limit (dBμV/m)	Margin (dB)
315	81.0	H	-13.59	67.41	67.66	0.25
315	60.5	V	-13.59	46.91	67.66	20.75
630	44.6	H	-13.59	34.01	47.66	16.65
630	43.3	V	-13.59	29.71	47.66	17.95
945	47.6	H	-13.59	34.01	47.66	13.65
945	46.7	V	-13.59	33.11	47.66	14.55

Note: All other spurious emission is the floor noise.

\*Within measurement uncertainty!

Note:

Calculate Average value based on duty cycle correction factor:

Duty cycle factor=  $20 \cdot \log(\text{duty cycle})$

For DVT-1001H and JDI-1001H:

$$\begin{aligned} T_{on} &= T_{on1}N_1 + T_{on2}N_2 + \dots + T_{onn}N_n \\ &= 1.40 \text{ ms} \cdot 2 + 0.50 \text{ ms} \cdot 25 + 0.80 \text{ ms} \cdot 5 \\ &= 19.3 \text{ ms} \end{aligned}$$

$$T_p = 92.30 \text{ ms}$$

$$\begin{aligned} \text{Duty cycle} &= T_{on}/T_p \\ &= 19.3/92.30 \\ &= 0.2091 \end{aligned}$$

$$\begin{aligned} \text{Duty cycle factor} &= 20 \cdot \log(\text{duty cycle}) \\ &= -13.59 \text{ dB} \end{aligned}$$

For 97356 and 97357:

$$\begin{aligned} \text{Duty cycle} &= T_{on}/T_p \\ &= 11.0/133.2 \\ &= 0.0826 \end{aligned}$$

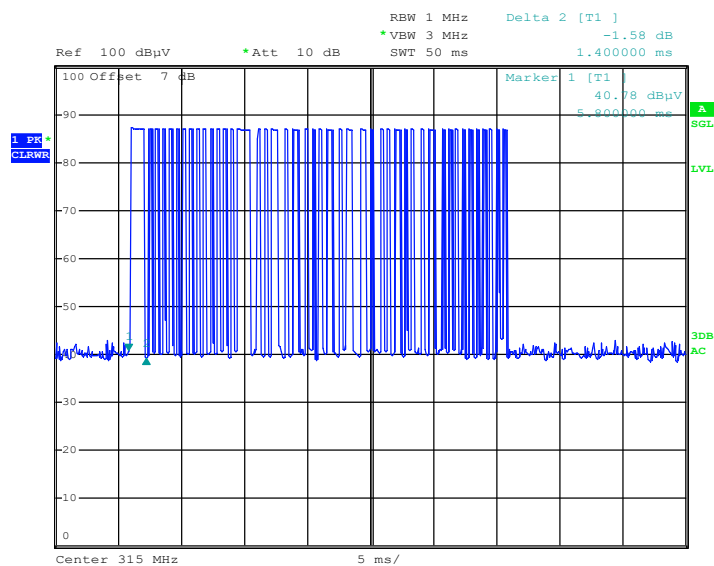
$$\begin{aligned} \text{Duty cycle factor} &= 20 \cdot \log(\text{duty cycle}) \\ &= -21.66 \text{ dB} \end{aligned}$$

So The Max. duty cycle is 20.91%, and correction factor is -13.59dB

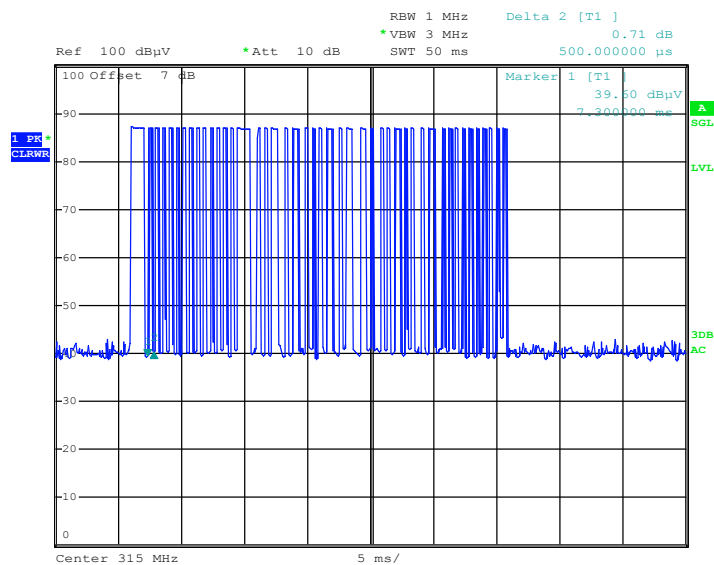
Average=Peak+ Duty cycle factor

Please refer to the following plot.

Model: DVT-1001H, JDI-1001H

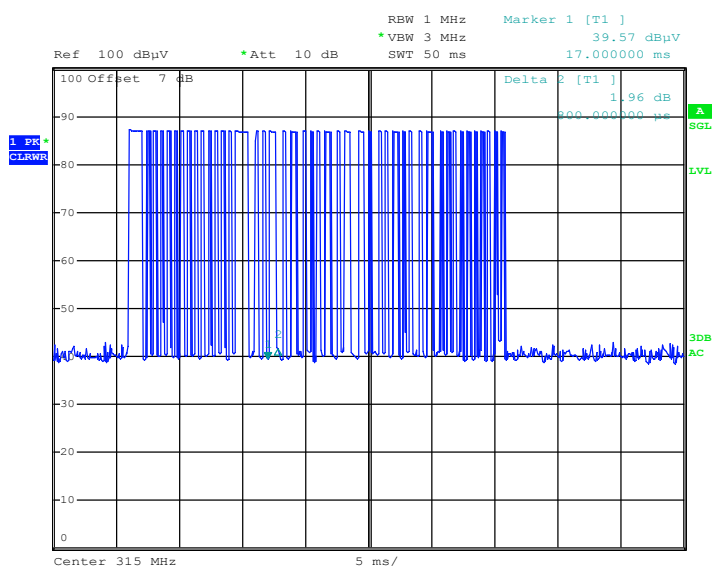
 $T_{on1}$ 

Date: 7.MAR.2016 15:52:46

 $T_{on2}$ 

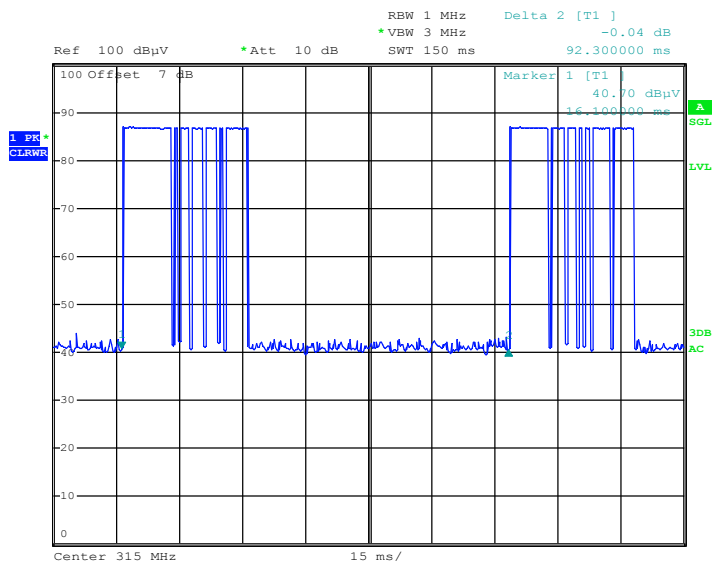
Date: 7.MAR.2016 15:53:06

$T_{on3}$



Date: 7.MAR.2016 15:53:42

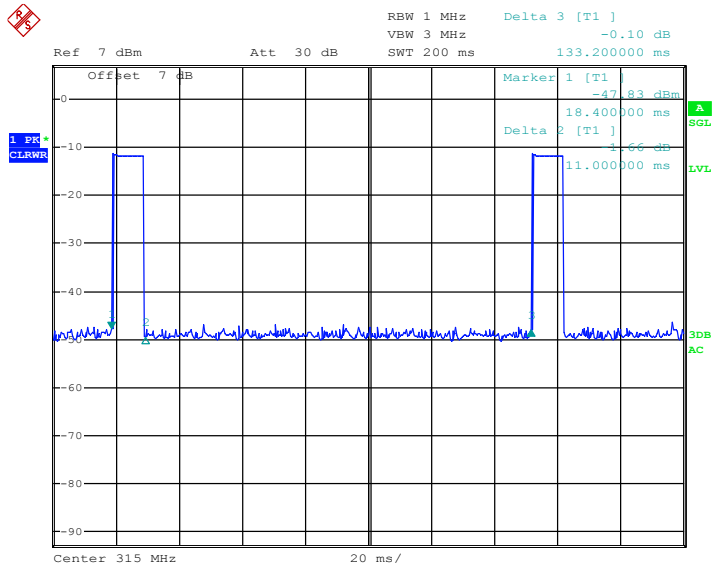
$T_p$



Date: 7.MAR.2016 15:57:26



Model: 97356, 97357



Date: 7.MAR.2016 16:56:42

## FCC §15.231(c) – 20 dB BANDWIDTH TESTING

### Requirement

Per 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.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
BACL	RF cable	KS-LAB-A01	KS-LAB-A01	2015-06-16	2016-12-15
BACL	Attenuator	KS-LAB-A06	KS-LAB-A06	2015-06-16	2016-12-15

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

### Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

### Test Data

#### Environmental Conditions

Temperature:	26 °C
Relative Humidity:	53 %
ATM Pressure:	101.0 kPa

*The testing was performed by Matt Yao on 2016-03-07*

*Test Mode: Transmitting*

*Please refer to following table and plot.*

Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
315.00	115.0	787.5	Pass

## 20 dB Bandwidth

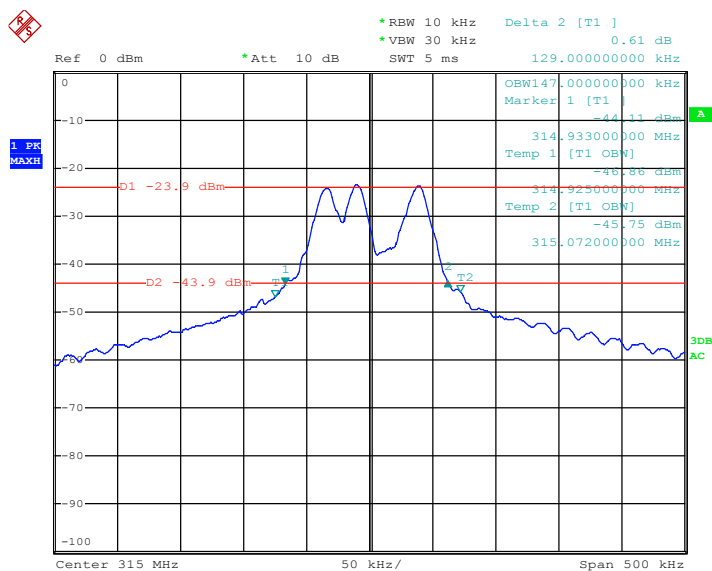


Model: 97356, 97357

Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
315.00	129.0	787.5	Pass

**Note:** Limit = 0.25% \* Center Frequency = 0.25% \* 315.00 MHz = 787.5 kHz  
 20dB Bandwidth=129.0 kHz<787.5 kHz

### 20 dB Bandwidth



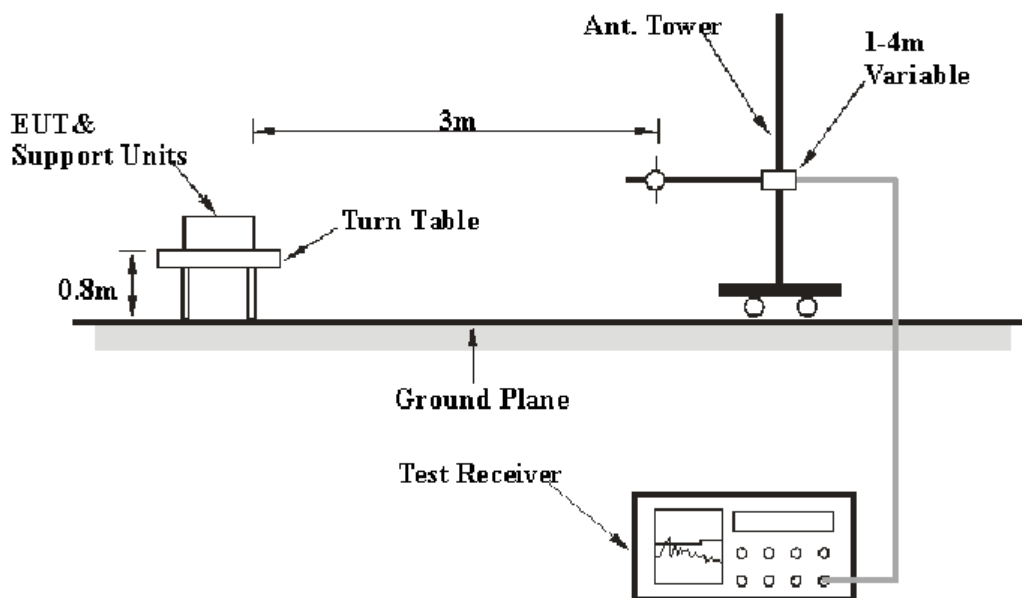
Date: 8.MAR.2016 18:15:59

## FCC §15.231(e) - DEACTIVATION TESTING

### Applicable Standard

Per 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.

### EUT Setup



The deactivation test was performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10- 2013. The specification used was the FCC 15.231(e) limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	Amplifier	330	171377	2015-09-16	2016-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2015-09-12	2016-09-12
champrotek	Chamber	Chamber A	1#	2015-09-17	2016-09-17
R&S	Auto test Software	EMC32	V 09.10.0	-	-
BACL	RF cable	KS-LAB-A01	KS-LAB-A01	2015-06-16	2016-12-15
BACL	RF cable	KS-LAB-A02	KS-LAB-A02	2015-06-16	2016-12-15

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	53 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Matt Yao on 2016-03-07*

*Test Mode: Transmitting*

*Please refer to following table and plot.*

Model: DVT-1001H, JDI-1001H

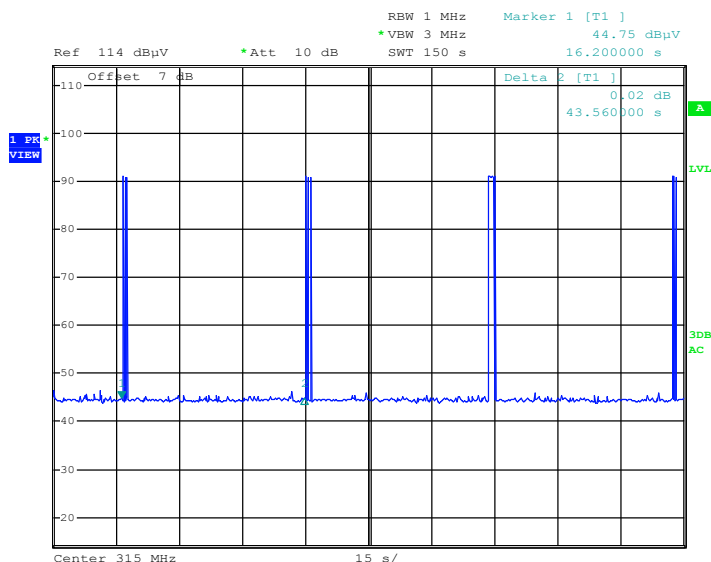
**Duration Time**

Transmission period (s)	Limit (s)	Result
0.126	< 1	Pass

**Silent Period**

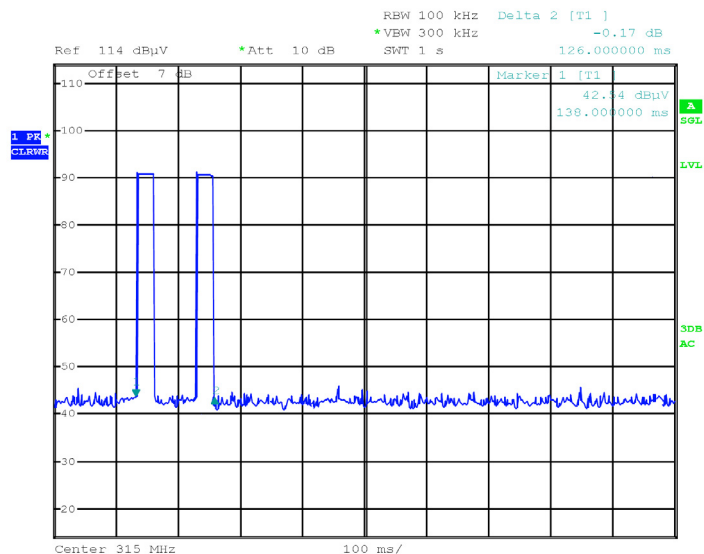
Silent period (s)	Limit (s)	Result
43.56	> 10	Pass

Note: The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

**Silent period**

Date: 7.MAR.2016 15:37:41

### Transmission period



Date: 7.MAR.2016 15:48:29

Model: 97356, 97357

### Deactivation

Transmission period (s)	Limit (s)	Result
0.163	< 1	Pass

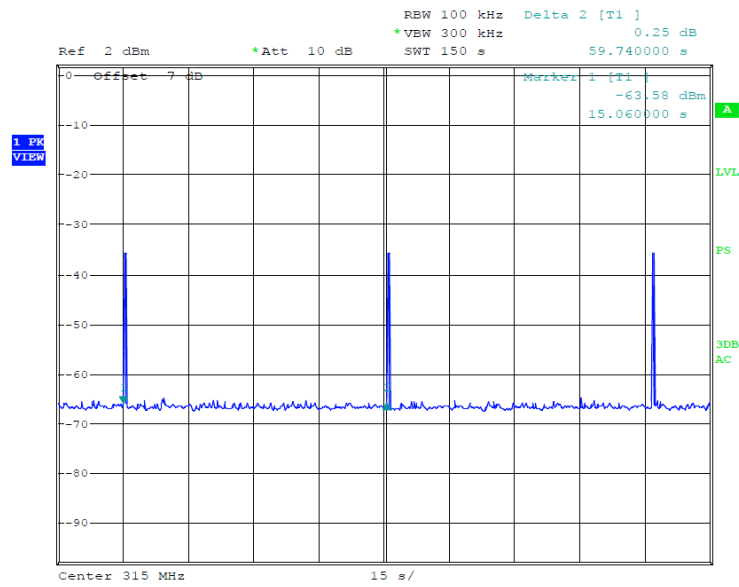
### Silent period

Silent period (s)	Limit (s)	Result
59.74	> 10	Pass

Note: The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

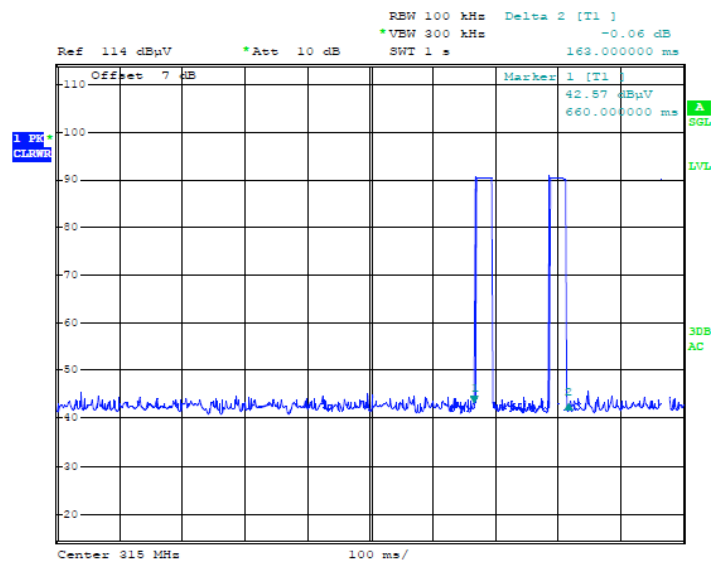


### Silent period



Date: 7.MAR.2016 15:54:20

### Transmission period



Date: 7.MAR.2016 15:58:11

## DECLARATION LETTER

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Hangzhou Hamaton Tyre Valves Co.,Ltd.

Add: 12 East Zhenxing Road, Linping, Yuhang, Hangzhou, China

Tel: 86-571-86159905

Fax: 86-571-86159905

E-Mail: zhangwb0892@163.com

### Product Similarity Declaration

Date: 2016-04-12

To:

FEDERAL COMMUNICATIONS COMMISSIONS

Authorization and Evaluation Division

7435 Oakland Mills Road

Columbia, MD 21046

We, Hangzhou Hamaton Tyre Valves Co.,Ltd. hereby declare that we have a product named as TPMS sensor(Model Number: DVT-1001H, 97356, FCC ID: Z27HTS2A315) was tested by BACL, meanwhile, for our marketing purpose, we would like to list a series models (Model Number: JDI-1001H, 97357) on reports and certificate. The differences between them are only the model number. No other changes are made to them. DVT-1001H and JDI-1001H's transmission rate is 45 seconds, 97356 and 97357's transmission rate is 60 seconds.

We confirm that all information above is true, and we'll be responsible for all the consequences. Please contact me if you have any question.

Signature:

A handwritten signature in black ink, appearing to read "weibo zhang".

Print Name: weibo zhang

Title: Quality Supervisor

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