



MEASUREMENT REPORT

FCC PART15 Subpart C (Section 15.209)

FCC ID: 2AK5Y-VT16-VT31

APPLICANT: Control Technology China., LTD

Application Type: Certification

Product: TPMS Activation Tool

Model No.: VT16, VT31

FCC Classification: Part 15 Low Power Transmitter Below 1705 kHz (DCD)

FCC Rule Part(s): FCC PART15 Subpart C (Section 15.209)

Test Procedure(s): ANSI C63.10-2013

Test Date: March 11 ~ 14, 2017

Reviewed By : Kevin Guo
(Kevin Guo)

Approved By : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.



Revision History

Report No.	Version	Description	Issue Date	Note
1703WSU00201	Rev. 01	Initial report	10-27-2017	Valid

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§2.1033 General Information

Applicant:	Control Technology China., LTD
Applicant Address:	Third and fourth floor, No.5 building, No.98 Jianpeng Road, Jiuting Town, SONGJIANG DISTRICT, SHANGHAI, 201615 P.R.CHINA
Manufacturer:	Control Technology China., LTD
Manufacturer Address:	Third and fourth floor, No.5 building, No.98 Jianpeng Road, Jiuting Town, SONGJIANG DISTRICT, SHANGHAI, 201615 P.R.CHINA
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	893164
FCC Rule Part(s):	FCC PART15 Subpart C (Section 15.209)
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Part 15 Low Power Transmitter Below 1705 kHz (DCD)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	TPMS Activation Tool
Model No.	VT16, VT31
Transmitting Frequency	125KHz
Reception Frequency	315MHz, 433.92MHz
Modulation	ASK, OOK
Operation Voltage	DC 6~10V (battery power)
Antenna for Transmitting	LC resonator circuit, Max gain 0dBi
Antenna for Reception	Quarter wave helix antenna

Note 1: The different of models is only for different customers, the others are the same, including designed circuit, others hardware and hardware control.

Note 2: The test report relate only to the "VT16" tested.

2.2. Test Mode

Test Mode	Mode 1: Transmit by 125KHz
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2.3. Description of Test Software

The test utility software used during testing was engineering directive ordered by applicant.

2.4. Test Configuration

The **TPMS Activation Tool** was tested per the guidance of FCC Part 15.209 and ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.5. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.6. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase.

However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION of TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in FCC Part 15.209 were used in the measurement of the **TPMS Activation Tool**.

Deviation from measurement procedure.....None

3.2. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable

containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.”

- The antenna of the Radio Controller is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The **TPMS Activation Tool** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATA

Radiated Emission-AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2018/06/21
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2017/12/21
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2017/11/19
DC Power Supply	GWINSTEK	DPS-99306D	MRTSUE06063	1 year	N/A
Digital Thermometer & Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2017/11/30
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2018/05/10

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Radiated Emission Measurement-AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz ~ 1GHz: 4.18dB

7. TEST RESULT

7.1. Summary

Company Name: Control Technology China., LTD

FCC ID: 2AK5Y-VT16-VT31

FCC Part Section(s)	Test Description	Test Condition	Test Result
15.209	Radiated Spurious Emissions	Radiated	Pass

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

7.2. Radiated Emissions

7.2.1. Standard Applicable

According to §15.209, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

FCC Part 15.209 Radiated Emission Limit		
Frequency (MHz)	Field strength microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Note:

1. RF Voltage (dBμv) = 20 log RF Voltage (μv)
2. 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.

7.2.2. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turntable 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 C63.10: 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 bandwidth of the antenna.

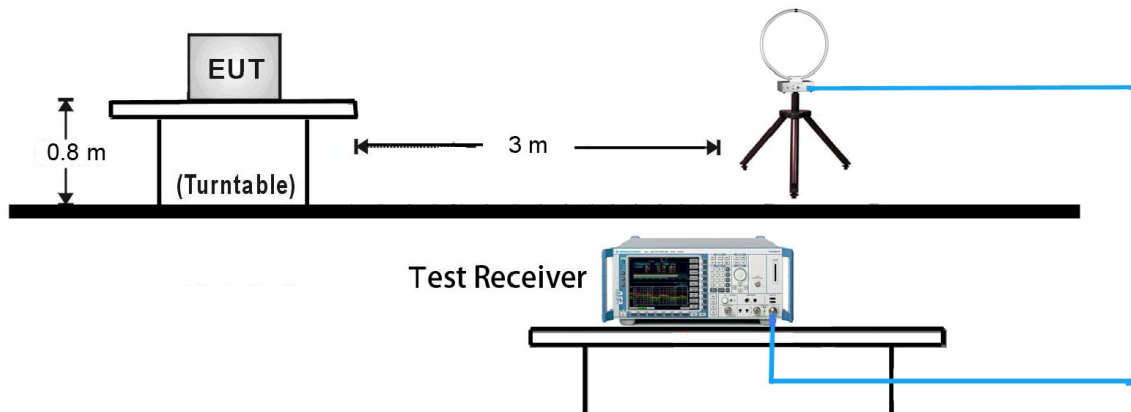
The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 9 KHz to 10th Harmonic of fundamental was investigated.

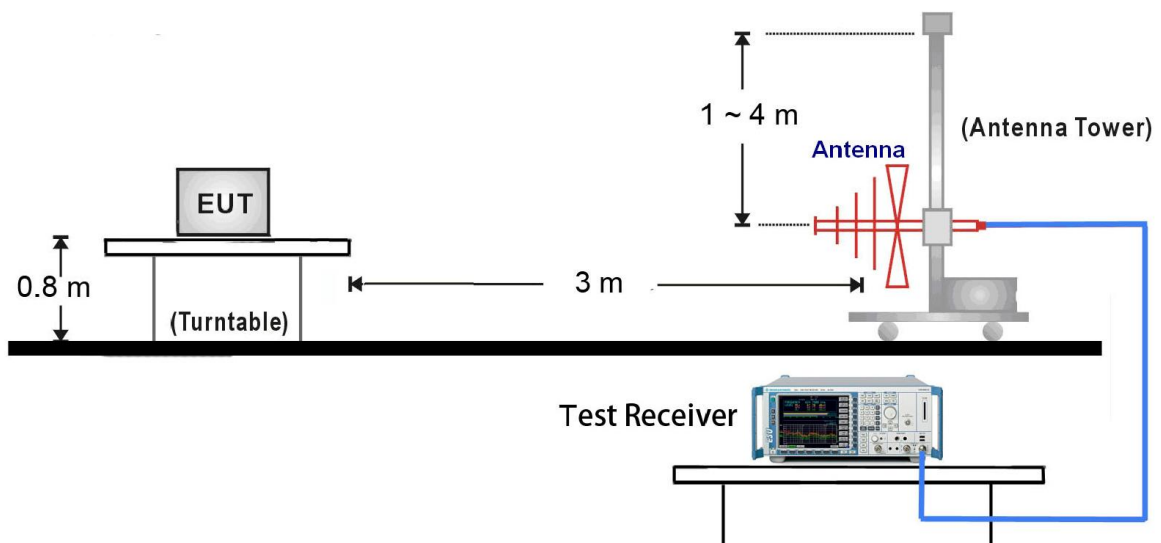
7.2.3. Test Setup

The setup of EUT is according with per ANSI C63.10-2009 measurement procedure. The specification used was FCC Part 15.209 Limit.

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



7.2.4. Test Results

Fundamental Emission

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
0.125	60.7	20.2	80.9	125.7	-44.8	Peak	Face on
0.125	60.7	20.2	80.9	125.7	-44.8	Peak	Face off

Note 1: $\text{Limit} = 25.666 \text{ dB}\mu\text{V/m} + 40 \cdot \log(300 \text{ m} / 3 \text{ m}) = 105.7 \text{ dB}\mu\text{V/m}$ (Average detector),
 $125.67 \text{ dB}\mu\text{V/m}$ (Peak detector).

Note 2: Measurement Level = Reading Level + Factor.

Note 3: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

General Radiated Emission 9kHz ~ 30MHz

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
0.019	44.7	21.3	66.0	122.0	-56.0	Peak	Face on
0.038	25.7	20.8	46.5	116.0	-69.5	Peak	Face on
0.613	27.3	20.5	47.8	111.9	-64.1	Peak	Face on
0.747	25.6	20.6	46.2	110.1	-63.9	Peak	Face on
0.019	44.8	21.3	66.1	122.0	-55.9	Peak	Face off
0.038	25.6	20.8	46.4	116.0	-69.6	Peak	Face off
0.538	15.7	20.5	36.2	113.0	-76.8	Peak	Face off
0.822	14.3	20.6	34.9	109.3	-74.4	Peak	Face off
0.019	44.7	21.3	66.0	122.0	-56.0	Peak	Face on
0.038	25.7	20.8	46.5	116.0	-69.5	Peak	Face on

Note:

1. Measurement Level = Reading Level + Factor.
2. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
3. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

General Radiated Emission 30MHz ~ 1GHz

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
168.2	5.1	14.4	19.5	43.5	-24.0	Peak	Horizontal
315.7	4.7	14.7	19.4	46.0	-26.6	Peak	Horizontal
36.8	13.1	14.1	27.2	40.0	-12.8	Peak	Vertical
44.1	11.1	14.2	25.3	40.0	-14.7	Peak	Vertical
65.4	10.3	12.4	22.7	40.0	-17.3	Peak	Vertical
99.8	13.1	11.0	24.1	43.5	-19.4	Peak	Vertical
291.9	13.7	14.1	27.8	46.0	-18.2	Peak	Vertical

Note:

1. Measurement Level = Reading Level + Factor.
2. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **TPMS Activation Tool** is in compliance with FCC Part 15.209 of the FCC Rules.

The End