

FCC TEST REPORT

FCC ID : **UPFNT-0506**

Applicant : **Dong Guan City Nannar Electronics Technology Co.,Ltd.**
Floor 4, building 7, Jin Tai industrial park, Wan Jiang district, Dong Guan
City, Guang Dong province

Equipment Under Test (EUT) :


Product description : Auto Tire Pressure Monitoring System

Model No. : NT-0502, NT-0503, NT-0506, NT-0508, NT-0509

Standards : FCC 15 Subpart C Paragraph 15.231

Date of Test : October 21, 2006

Test Engineer : **Tiger Su**

Reviewed By : 

PERPARED BY:

Waltek Services (Shenzhen) Co., Ltd.

8C, West Tower, Aidi Building, No.5003 Binhe Rd, Futian District, Shenzhen518045,
Guangdong, China.

Tel: 86-755-83551033

Fax: 86-755-83552400

2 Contents

| | Page |
|--|-----------|
| 1 COVER PAGE..... | 1 |
| 2 CONTENTS..... | 2 |
| 3 TEST SUMMARY..... | 5 |
| 4 GENERAL INFORMATION..... | 6 |
| 4.1 CLIENT INFORMATION | 6 |
| 4.2 GENERAL DESCRIPTION OF E.U.T..... | 6 |
| 4.3 DETAILS OF E.U.T. | 6 |
| 4.4 DESCRIPTION OF SUPPORT UNITS | 6 |
| 4.5 STANDARDS APPLICABLE FOR TESTING..... | 6 |
| 4.6 TEST FACILITY..... | 7 |
| 4.7 TEST LOCATION..... | 7 |
| 5 EQUIPMENT USED DURING TEST | 8 |
| 6 CONDUCTED EMISSION TEST | 9 |
| 6.1 TEST EQUIPMENT..... | 9 |
| 6.2 TEST PROCEDURE | 9 |
| 6.3 CONDUCTED TEST SETUP | 10 |
| 6.4 EUT OPERATING CONDITION | 10 |
| 6.5 CONDUCTED EMISSION LIMITS | 11 |
| 6.6 CONDUCTED EMISSION TEST RESULT..... | 11 |
| 7 RADIATION EMISSION TEST..... | 12 |
| 7.1 TEST EQUIPMENT..... | 12 |
| 7.2 MEASUREMENT UNCERTAINTY..... | 12 |
| 7.3 TEST PROCEDURE | 12 |
| 7.4 RADIATED TEST SETUP..... | 13 |
| 7.5 SPECTRUM ANALYZER SETUP..... | 13 |
| 7.6 CORRECTED AMPLITUDE & MARGIN CALCULATION | 14 |
| 7.7 SUMMARY OF TEST RESULTS..... | 14 |
| 7.8 EUT OPERATING CONDITION | 15 |
| 7.9 RADIATED EMISSIONS LIMIT..... | 15 |
| 7.10 RADIATED EMISSIONS TEST RESULT..... | 16 |
| 7.10.1 Radiated Emission Data..... | 16 |
| 8 PERIODIC OPERATION..... | 18 |
| 9 BAND EDGE | 19 |
| 9.1 TEST PROCEDURE | 19 |
| 9.2 BAND EDGE | 19 |
| 9.3 BAND EDGE TEST RESULT | 20 |
| 10 PHOTOGRAPHS OF TESTING..... | 21 |
| 10.1 RADIATION EMISSION TEST VIEW FOR 30MHZ-1000MHZ..... | 21 |
| 10.2 RADIATION EMISSION TEST VIEW FOR 1GHZ-5GHZ..... | 21 |

- 11 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS22**
- 11.1 EUT - FRONT VIEW22
- 11.2 EUT - BACK VIEW22
- 11.3 PCB-FRONT VIEW23
- 11.4 PCB-BACK VIEW23
- 11.5 BATTERY-FRONT VIEW24
- 11.6 BATTERY-BACK VIEW24
- 12 FCC ID LABEL25**

3 Test Summary

| Test | Test Requirement | Test Method | Class / Severity | Result |
|---|-------------------------|--------------------|-------------------------|---------------|
| Radiated Emission (30MHz to 5GHz) | FCC PART 15: 2003 | ANSI C63.4: 2003 | Class B | PASS |
| Conducted Emission (150KHz to 30MHz) | FCC PART 15: 2003 | ANSI C63.4: 2003 | Class B | N/A |

4 General Information

4.1 Client Information

Applicant: **Dong Guan City Nannar Electronics Technology Co.,Ltd.**
Address: Floor 4, building 7, Jin Tai industrial park, Wan Jiang district,
Dong Guan City, Guang Dong province
Manufacturer: **Dong Guan City Nannar Electronics Technology Co.,Ltd.**
Address: Floor 4, building 7, Jin Tai industrial park, Wan Jiang district,
Dong Guan City, Guang Dong province

4.2 General Description of E.U.T.

Product description: Auto Tire Pressure Monitoring System
Model No.: NT-0502, NT-0503, NT-0506, NT-0508, NT-0509

4.3 Details of E.U.T.

Power Supply: Transmitter: DC 3.0 V Battery

4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a Auto Tire Pressure Monitoring System. The standards used were FCC 15 Paragraph 15.231, Paragraph 15.205, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

4.6 Test Facility

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

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd. ShenZhen Branch EMC Lab, 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, August 04, 2005.

4.7 Test Location

All Emissions tests were performed at:-

No.1 Workshop, M-10, Middle Section, Science & Technology Park, ShenZhen, China 518057

5 Equipment Used during Test

| Equipment | Brand Name | Model | Cal. Int Months | Last Cal. Date |
|-------------------------------|--------------|-----------|-----------------|----------------|
| 3m Anechoic chamber | | | | |
| EMC Analyzer | Agilent | E7402A | 12 | 2006-08-30 |
| EMI Test Receiver | R&S | ESS | 12 | 2006-08-30 |
| Pre Amplifier | Anritsu | MH648A | 12 | 2006-08-30 |
| Bilog Antenna | SCHAFFNER | CBL6111C | 12 | 2006-08-30 |
| Horn Antenna | ETS.LINDGERN | GH14-H052 | 12 | 2006-08-30 |
| AM/FM Stereo Signal Generator | Panasonic | VP-8122A | 12 | 2006-08-30 |
| Signal Generator | R&S | SMG | 12 | 2006-08-30 |
| RF Selector | TOYO | NS4901A | - | - |
| Turn Disc | HD | DS4150S | - | - |
| Antenna Mast | HD | MA2400 | - | - |
| EMI Shielded Room | | | | |
| Spectrum analyzer | ADVANTEST | R3261C | 12 | 2006-08-30 |
| EMI Test Receiver | R&S | ESS | 12 | 2006-08-30 |
| Pre Amplifier | Anritsu | MH648A | 12 | 2006-08-30 |
| LISN | R&S | ENV216 | 12 | 2006-08-30 |
| LISN | Kyoritsu | KNW-403D | 12 | 2006-08-30 |
| Absorbing Clamp | R&S | MDS-21 | 12 | 2006-08-30 |
| Distortion Meter | MEGURO | MAK-6578A | 12 | 2006-08-30 |
| AM/FM Stereo Signal Generator | Panasonic | VP-8122A | 12 | 2006-08-30 |
| Oscilloscope | LEADER | LS1020 | 12 | 2006-08-30 |
| Function Generator | National | VP-7422A | 12 | 2006-08-30 |
| Signal Generator | R&S | SMG | 12 | 2006-08-30 |
| RF Selector | TOYO | NS4000 | - | - |
| RF Selector | TOYO | NS4900 | - | - |
| Remote Controller | TOYO | MAC | - | - |

6 Conducted Emission Test

| | |
|-------------------|--|
| Product Name: | Auto Tire Pressure Monitoring System |
| Test Requirement: | FCC Part15 Paragraph 15.207 |
| Test Method: | Based on FCC Part15 Paragraph 15.207 |
| Test Date: | |
| Frequency Range: | 150kHz to 30MHz |
| Class: | Class B |
| Detector: | Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit |

6.1 Test Equipment

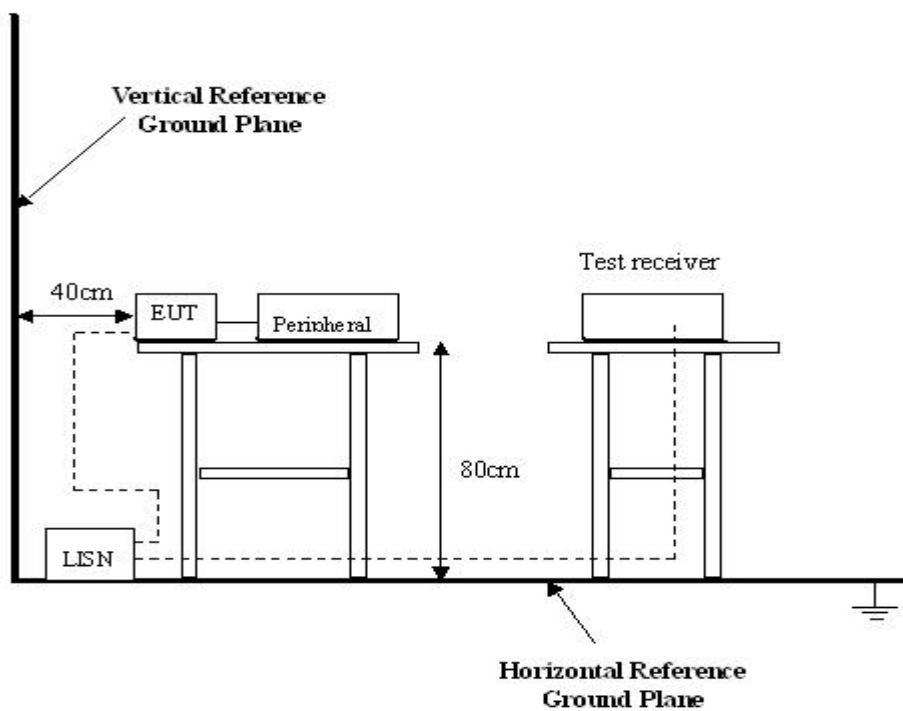
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4: 2003. The frequency spectrum from 150kHz to 30MHz was investigated.
2. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.3 Conducted Test Setup

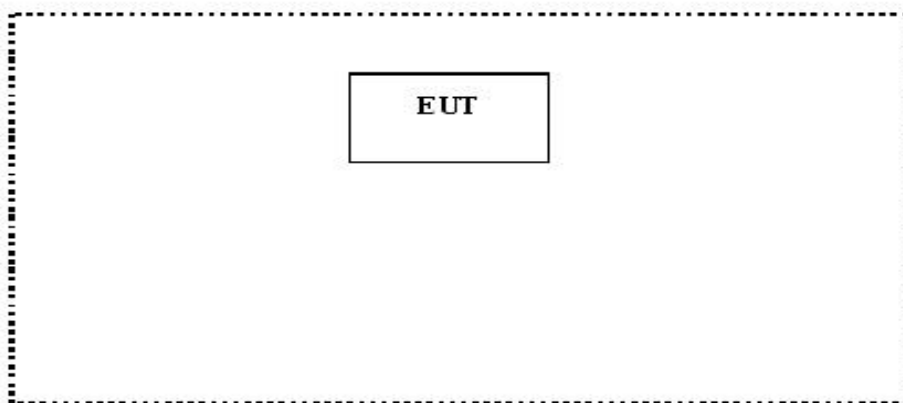
The conducted emission tests were performed using the setup accordance with the ANSI C63.4: 2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4 EUT Operating Condition

Operating condition is according to ANSI C63.4: 2003.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



6.5 Conducted Emission Limits

66-56 dB μ V/m between 0.15MHz & 0.5MHz

56 dB μ V/m between 0.5MHz & 5MHz

60 dB μ V/m between 5MHz & 30MHz

Note: In the above limits, the tighter limit applies at the band edges.

6.6 Conducted Emission Test Result

Owing to the DC operation of EUT, this test is not performed.

7 Radiation Emission Test

| | |
|-----------------------|---|
| Product Name: | Auto Tire Pressure Monitoring System |
| Test Requirement: | FCC Part15 Paragraph 15.231 |
| Test Method: | Based on FCC Part15 Paragraph 15.33 |
| Test Date: | October 21, 2006 |
| Frequency Range: | 30MHz to 5GHz |
| Measurement Distance: | 3m |
| Detector: | Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit |

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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.

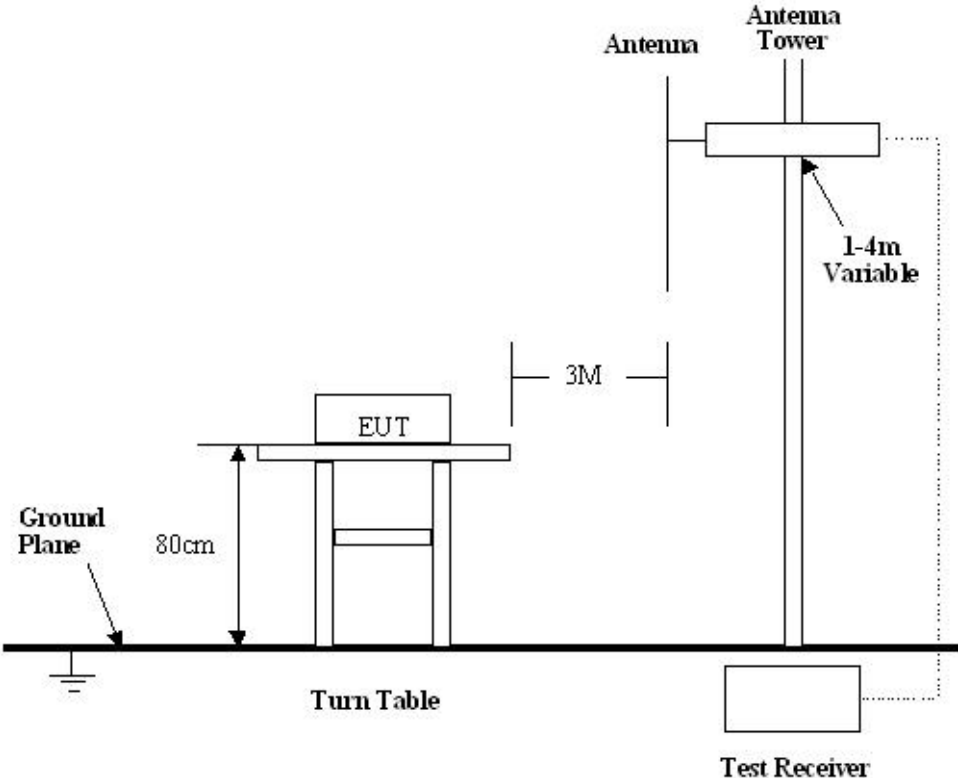
Based on ANSI C63.4: 2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SGS EMC Lab is +4.0 dB.

7.3 Test Procedure

1. For the radiated emissions test, since the EUT does not have a power source, there was no connection to AC outlets.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
3. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB μ V of specification limits), and are distinguished with a "Qp" in the data table.
4. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

7.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003, The specification used in this report was the FCC Part15 Paragraph 15.231, Paragraph 15.209 limits.



7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.231 Rules, the system was tested to 5000 MHz.

- Start Frequency30 MHz
- Stop Frequency5000 MHz
- Sweep Speed Auto
- IF Bandwidth100 kHz
- Video Bandwidth1 MHz
- Quasi-Peak Adapter Bandwidth120 kHz
- Quasi-Peak Adapter Mode.....Normal
- Resolution Bandwidth1MHz

7.6 Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

7.7 Summary of Test Results

According to the data in section 7.10, the EUT complied with the FCC Part15 Paragraph 15.231 standards.

7.8 EUT Operating Condition

Same as section 6.4 of this report.

7.9 Radiated Emissions Limit

| 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 \1\.. | 50 to 150 \1\ |
| 174-260..... | 1,500..... | 150 |
| 260-470..... | 1,500 to 5,000 \1\ | 150 to 500 \1\ |
| Above 470..... | 5,000..... | 500 |

7.10 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was established by adding
The meter reading of the spectrum analyser (which is set to read in units of dBuV)
To the antenna correction factor supplied by the antenna manufacturer. The antenna
Correction factors are stated in terms of dB.The gain of the presselector was accounted
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

7.10.1 Radiated Emission Data

| | |
|---------------|------------------------|
| Test Item: | Radiated Emission Data |
| Test Voltage: | DC 3.0 V |
| Test Mode: | TX On |
| Temperature: | 24 °C |
| Humidity: | 52%RH |
| Test Result: | PASS |

| Frequency (MHz) | Antenna Polarization | Emission Level (dBuV/m) | FCC 15 Subpart C Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|-----------------|----------------------|-------------------------|---------------------------------|-------------|--------------------|---------------------|
| 433.92 | Vertical | 57.90 | 72.87 | 14.97 | 1.5 | 90 |
| 433.92 | Horizontal | 58.01 | 72.87 | 14.86 | 1.5 | 90 |
| 867.84 | Vertical | 35.20 | 52.87 | 17.67 | 1.2 | 90 |
| 1301.76 | Vertical | 38.62 | 54.00 | 15.38 | 2.0 | 180 |
| 1735.68 | Vertical | 38.17 | 54.00 | 15.83 | 1.8 | 60 |
| 2169.60 | Vertical | 37.77 | 54.00 | 16.23 | 2.0 | 45 |
| 867.84 | Horizontal | 34.15 | 52.87 | 18.72 | 1.5 | 45 |
| 1301.76 | Horizontal | 40.50 | 54.00 | 13.50 | 1.6 | 60 |
| 1735.68 | Horizontal | 37.69 | 54.00 | 16.31 | 2.0 | 180 |
| 2169.60 | Horizontal | 38.43 | 54.00 | 15.57 | 2.0 | 90 |

Where F is the frequency in MHz, The formulas for calculating the maximum permitted fundamental field strengths are as follows:

- (1). For the band 130-174MHz, $\mu\text{V/m}$ at 3 meters = $22.72727(F) - 2454.545$;
- (2). For the band 260-470MHz, $\mu\text{V/m}$ at 3 meters = $16.6667(F) - 2833.3333$.

Sample calculation of limit @ 433.92MHz

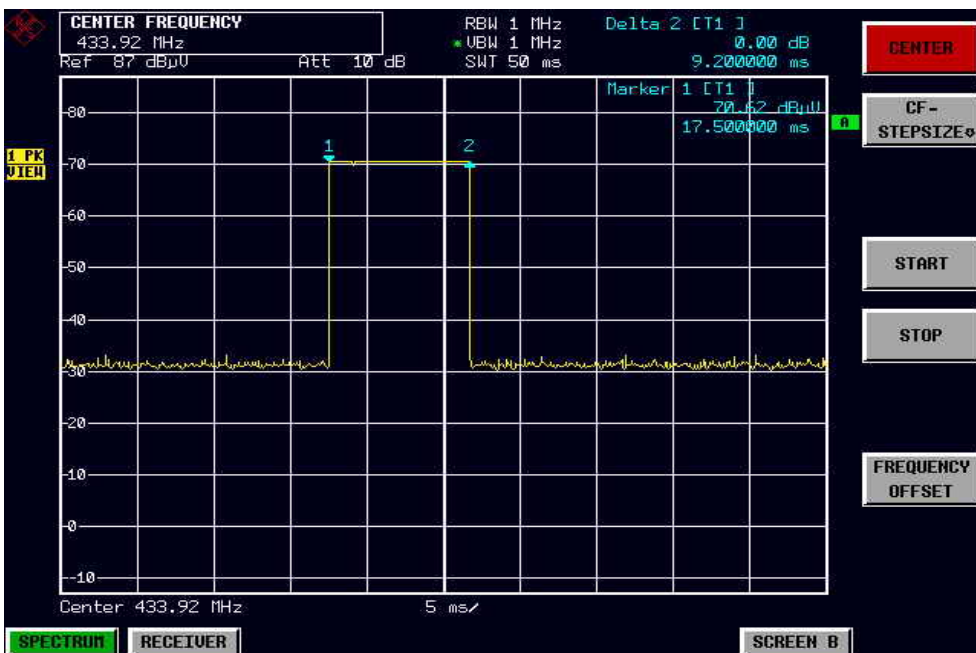
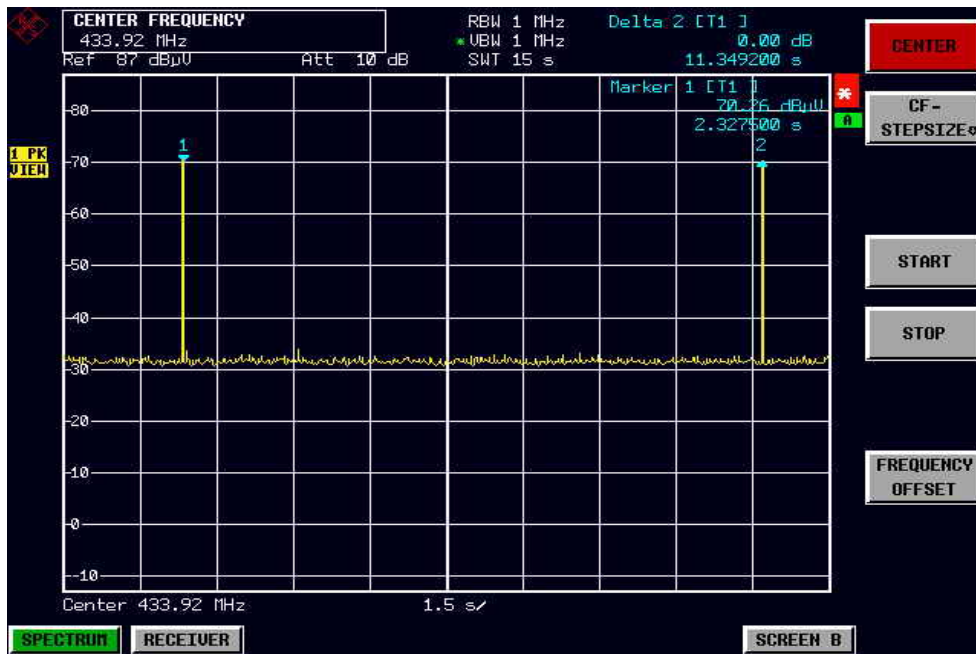
$$16.6667(433.92) - 2833.3333 = 4398.681164 \mu\text{V/m}$$

$$20\log(4398.681164) = 72.87 \text{ dBuV/m limit @ 433.92MHz}$$

8 Periodic Operation

In addition, 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.

Refer to the duty cycle plot (as below), We find each the duration transmission for the device is about 9.2 ms. and silent period between transmissions is about 11.34 seconds, This device does meet the FCC requirement.



9 Band Edge

| | |
|-------------------|--------------------------------------|
| Test Requirement: | FCC Part15 C |
| Test Method: | Based on FCC Part15 Paragraph 15.231 |
| Test Date: | October 21, 2006 |
| Test mode: | TX On |
| Temperature: | 24 °C |
| Humidity: | 52%RH |

9.1 Test Procedure

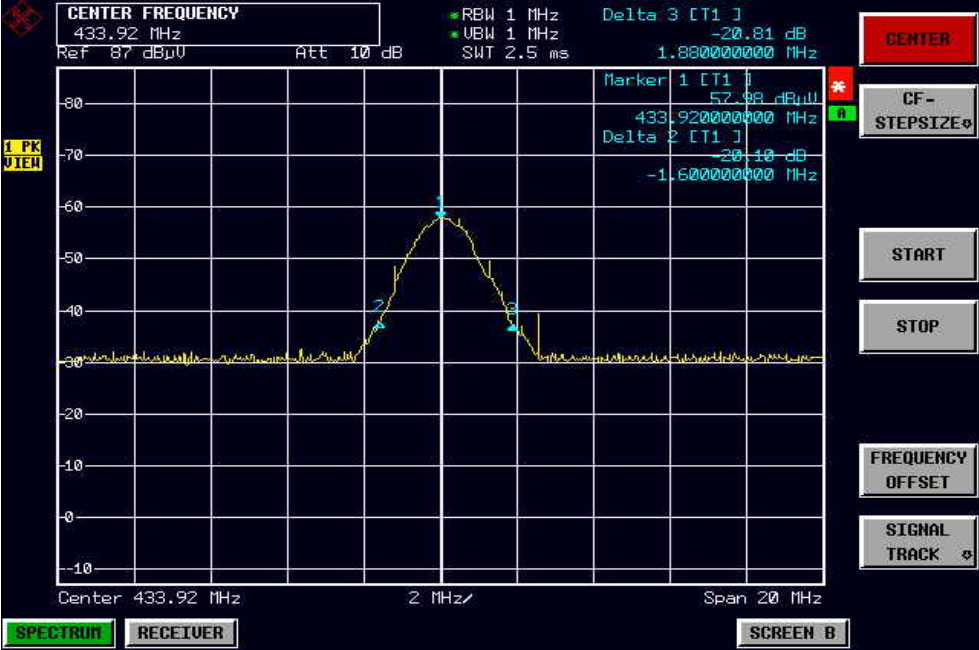
1. The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4: 2003.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 1MHz RBW and 1MHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

9.2 Band Edge

Requirements: 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.

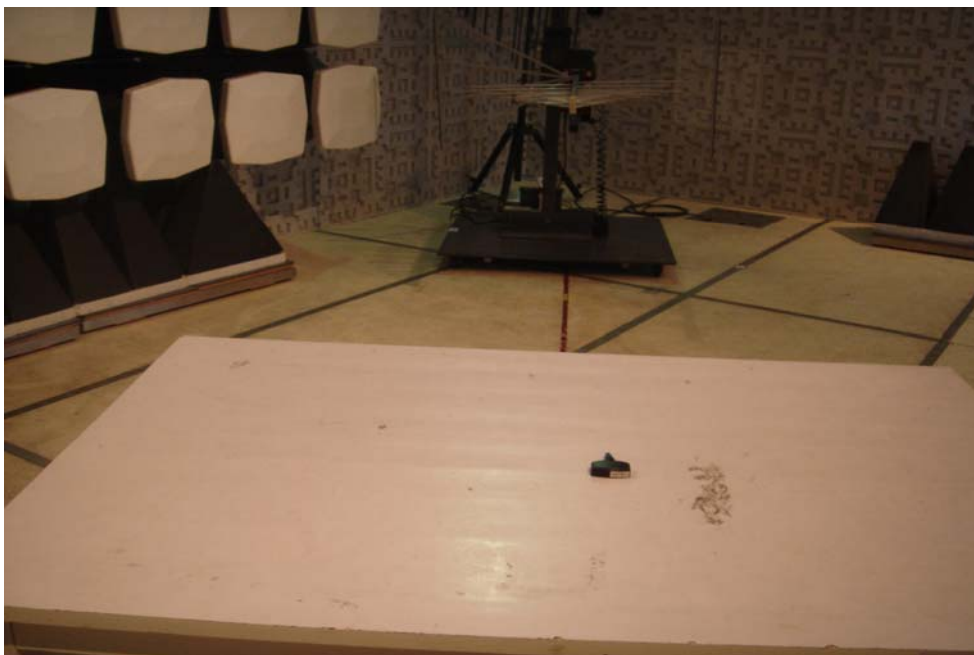
9.3 Band Edge Test Result

433.92 MHz TX

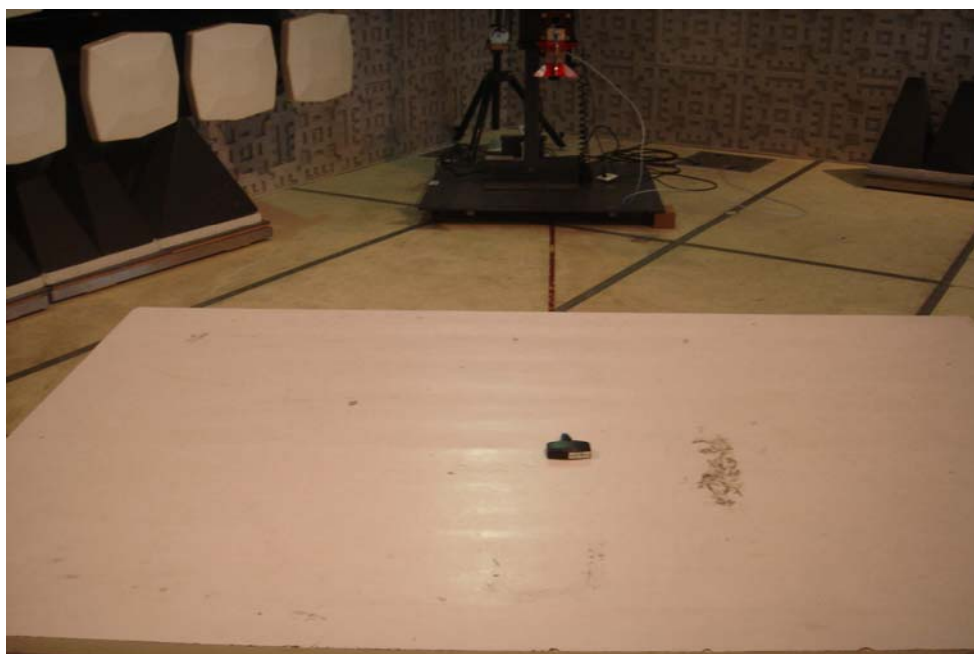


10 Photographs of Testing

10.1 Radiation Emission Test View For 30MHz-1000MHz

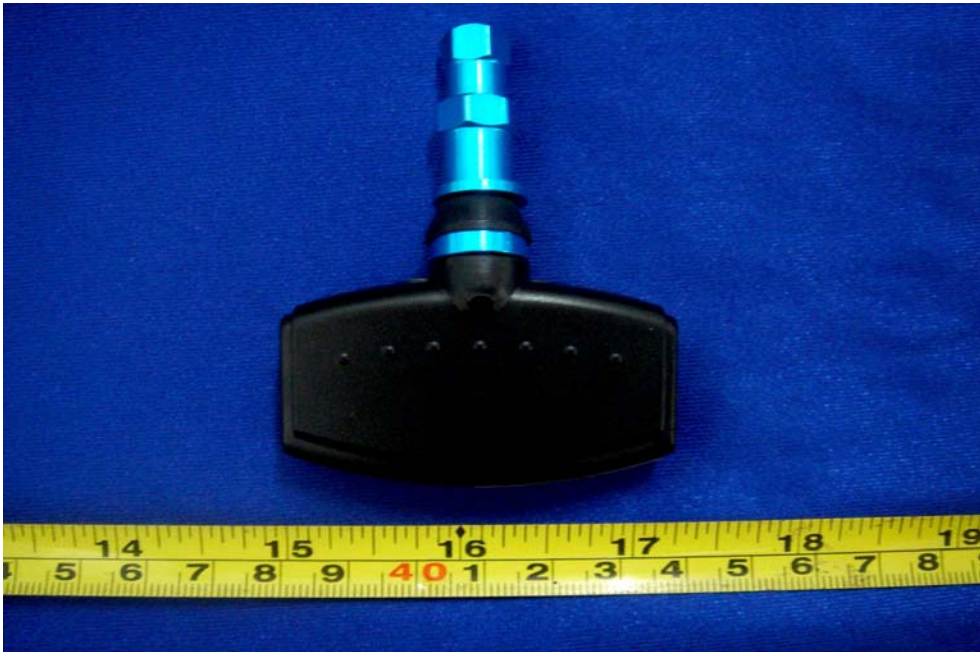


10.2 Radiation Emission Test View For 1GHz-5GHz

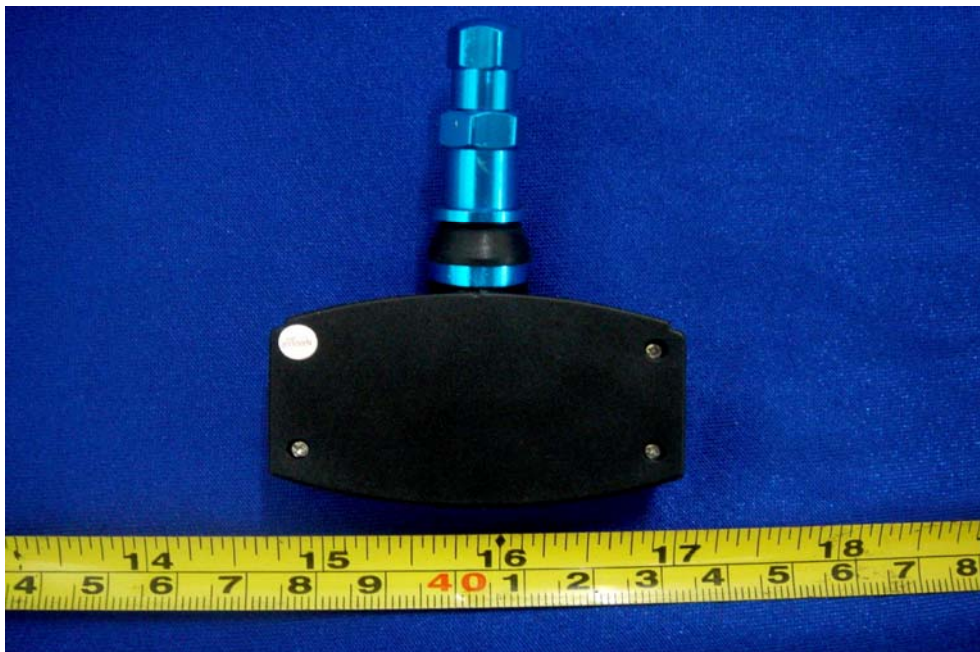


11 Photographs - Constructional Details

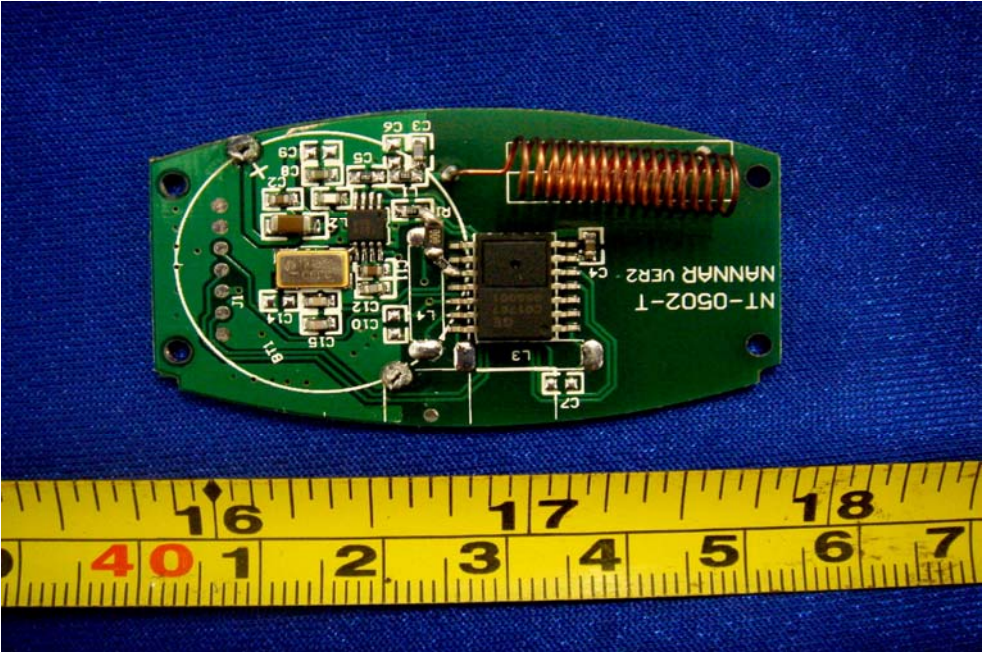
11.1 EUT - Front View



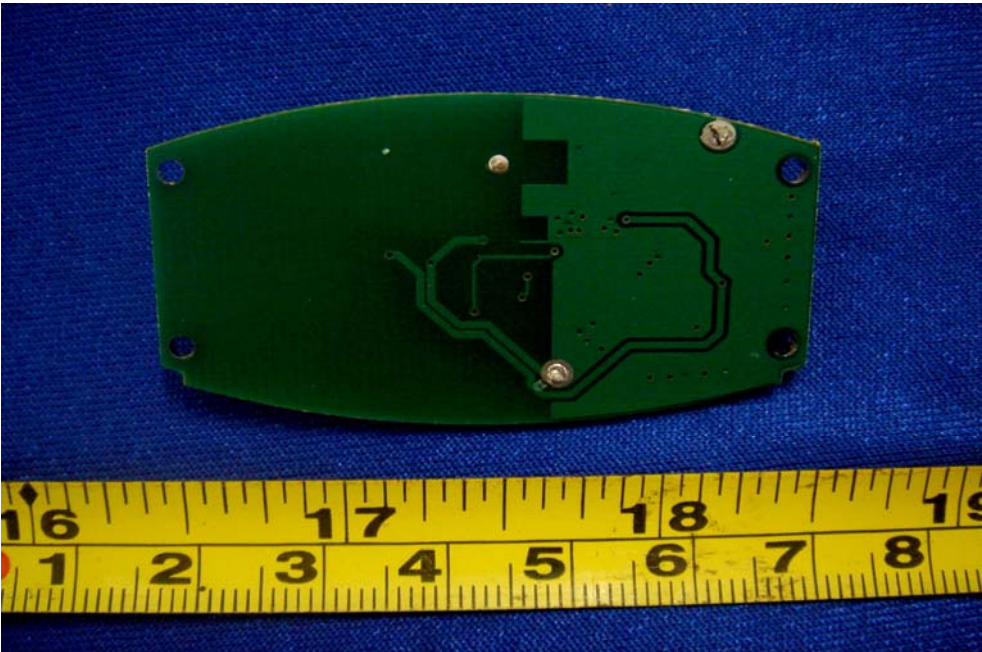
11.2 EUT - Back View



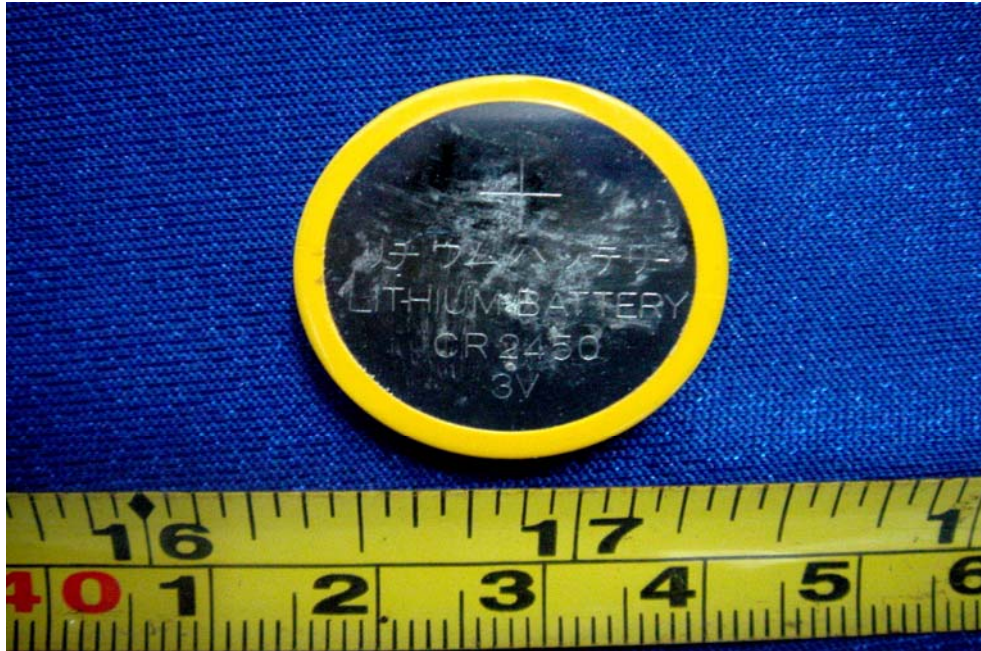
11.3 PCB-Front View



11.4 PCB-Back View



11.5 Battery-Front View



11.6 Battery-Back View



12 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference,and (2) this device must accept any interference received, including interference that may cause undesired operation

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT
EUT Bottom View/proposed FCC Mark Location

