

# TEST REPORT

**FCC ID: 2AMNXTN200**

**Product: Internal sensor**

**Model No.: TN200**

**Additional Model: TN201, TN202, TN203, TN204, TN205, TN206, TN207, TN208**

**Trade Mark: N/A**

**Report No.: TCT171226E004**

**Issued Date: Jan. 09, 2018**

Issued for:

**ShenZhen Porcsi Technology Co., Ltd**

**10/F, Jia Yi Da Industrial Park, Liao Keng, ShiYan, BaoAn, ShenZhen, China**

Issued By:

**Shenzhen Tongce Testing Lab.**

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**Appendix A: Photographs of Test Setup**

**Appendix B: Photographs of EUT**

## 1. Test Certification

|                              |                                                                            |
|------------------------------|----------------------------------------------------------------------------|
| <b>Product:</b>              | Internal sensor                                                            |
| <b>Model No.:</b>            | TN200                                                                      |
| <b>Additional Model No.:</b> | TN201, TN202, TN203, TN204, TN205, TN206, TN207, TN208                     |
| <b>Trade Mark:</b>           | N/A                                                                        |
| <b>Applicant:</b>            | ShenZhen Porcsi Technology Co., Ltd                                        |
| <b>Address:</b>              | 10/F, Jia Yi Da Industrial Park, Liao Keng, ShiYan, BaoAn, ShenZhen, China |
| <b>Manufacturer:</b>         | ShenZhen Porcsi Technology Co., Ltd                                        |
| <b>Address:</b>              | 10/F, Jia Yi Da Industrial Park, Liao Keng, ShiYan, BaoAn, ShenZhen, China |
| <b>Date of Test:</b>         | Dec. 27, 2017 – Jan. 08, 2018                                              |
| <b>Applicable Standards:</b> | FCC CFR Title 47 Part 15 Subpart C Section 15.231                          |

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Jin Wang

Date:

Jan. 08, 2018

Reviewed By:



Joe Zhou

Date:

Jan. 09, 2018

Approved By:



Tomsin

Date:

Jan. 09, 2018

## 2. Test Result Summary

| Requirement                              | CFR 47 Section                          | Result |
|------------------------------------------|-----------------------------------------|--------|
| Conduction Emission,<br>0.15MHz to 30MHz | §15.207                                 | N/A    |
| Transmission time and silent<br>time     | 15.23(e)                                | PASS   |
| Radiation Emission                       | §15.231(e), §15.205, §15.209,<br>§15.35 | PASS   |
| Occupied Bandwidth                       | §15.231(c)                              | PASS   |

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 3. EUT Description

|                               |                                                                                                                                                         |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product:</b>               | Internal sensor                                                                                                                                         |
| <b>Model No.:</b>             | TN200                                                                                                                                                   |
| <b>Additional Model No.:</b>  | TN201, TN202, TN203, TN204, TN205, TN206, TN207, TN208                                                                                                  |
| <b>Trade Mark:</b>            | N/A                                                                                                                                                     |
| <b>Operation Frequency:</b>   | 433.92MHz                                                                                                                                               |
| <b>Modulation Technology:</b> | FSK                                                                                                                                                     |
| <b>Antenna Type:</b>          | External Antenna                                                                                                                                        |
| <b>Antenna Gain:</b>          | 0dBi                                                                                                                                                    |
| <b>Power Supply:</b>          | DC 3V( The button battery*1)                                                                                                                            |
| <b>Remark:</b>                | All models above are identical in interior structure, electrical circuits and components, just model names are different for the marketing requirement. |

## 4. General Information

### 4.1. Test Environment and Mode

| Operating Environment:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Temperature:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 24.0 °C                                                 |
| Humidity:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 54 % RH                                                 |
| Atmospheric Pressure:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1010 mbar                                               |
| Test Mode:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                         |
| Operation mode:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Keep the EUT in continuous transmitting with modulation |
| <p>The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y &amp; Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p> |                                                         |

### 4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|-----------|-----------|------------|--------|------------|
| /         | /         | /          | /      | /          |

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 5. Facilities and Accreditations

### 5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

### 5.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                          | MU                        |
|-----|-------------------------------|---------------------------|
| 1   | Conducted Emission            | $\pm 2.56\text{dB}$       |
| 2   | RF power, conducted           | $\pm 0.12\text{dB}$       |
| 3   | Spurious emissions, conducted | $\pm 0.11\text{dB}$       |
| 4   | All emissions, radiated(<1G)  | $\pm 3.92\text{dB}$       |
| 5   | All emissions, radiated(>1G)  | $\pm 4.28\text{dB}$       |
| 6   | Temperature                   | $\pm 0.1^{\circ}\text{C}$ |
| 7   | Humidity                      | $\pm 1.0\%$               |

## 6. Test Results and Measurement Data

### 6.1. Antenna Requirement

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FCC Part15 C Section 15.203 /247(c) |
| <p>15.203 requirement:<br/>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.</p> <p>15.247(c) (1)(i) requirement:<br/>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p> |                                     |
| <b>E.U.T Antenna:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                     |
| <p>The antenna is External Antenna which permanently attached, and the best case gain of the antenna is 0dBi.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |



## 6.2. Conducted Emission

### 6.2.1. Test Specification

| Test Requirement:     | FCC Part15 C Section 15.207                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|--|------------|---------|----------|-----------|-----------|-------|----|----|------|----|----|
| Test Method:          | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Frequency Range:      | 150 kHz to 30 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Receiver setup:       | RBW=9 kHz, VBW=30 kHz, Sweep time=auto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Limits:               | <table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                               | Frequency range (MHz) | Limit (dBuV) |  | Quasi-peak | Average | 0.15-0.5 | 66 to 56* | 56 to 46* | 0.5-5 | 56 | 46 | 5-30 | 60 | 50 |
| Frequency range (MHz) | Limit (dBuV)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
|                       | Quasi-peak                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Average               |              |  |            |         |          |           |           |       |    |    |      |    |    |
| 0.15-0.5              | 66 to 56*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 56 to 46*             |              |  |            |         |          |           |           |       |    |    |      |    |    |
| 0.5-5                 | 56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 46                    |              |  |            |         |          |           |           |       |    |    |      |    |    |
| 5-30                  | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 50                    |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Test Setup:           | <div><p>Reference Plane</p><p>Remark:<br/>E.U.T: Equipment Under Test<br/>LISN: Line Impedance Stabilization Network<br/>Test table height=0.8m</p></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Test Mode:            | Transmitting Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Test Procedure:       | <div><div>1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</div><div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div><div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</div></div> |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |
| Test Result:          | N/A; The EUT powered by battery, so this test item is not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |              |  |            |         |          |           |           |       |    |    |      |    |    |

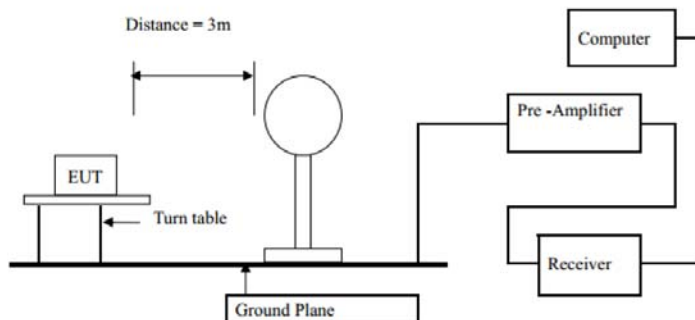
## 6.3. Radiated Emission Measurement

### 6.3.1. Test Specification

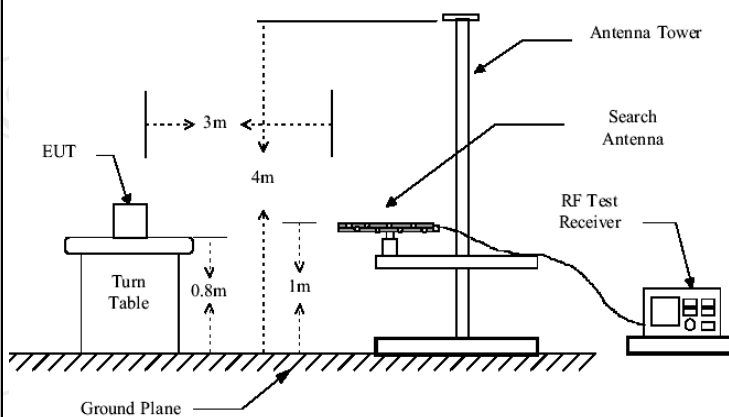
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |        |               |                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------|---------------|------------------|
| Test Requirement:     | FCC Part15 C Section 15.231(e) and 15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |        |               |                  |
| Test Method:          | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |        |               |                  |
| Frequency Range:      | 9 kHz to 5 GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |        |               |                  |
| Measurement Distance: | 3 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |        |               |                  |
| Antenna Polarization: | Horizontal & Vertical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |        |               |                  |
| Receiver Setup:       | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Detector   | RBW    | VBW           | Remark           |
|                       | 9kHz- 150kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Quasi-peak | 200Hz  | 1kHz          | Quasi-peak Value |
|                       | 150kHz- 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Quasi-peak | 9kHz   | 30kHz         | Quasi-peak Value |
|                       | 30MHz-1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Quasi-peak | 100KHz | 300KHz        | Quasi-peak Value |
|                       | Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Peak       | 1MHz   | 3MHz          | Peak Value       |
| Peak                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1MHz       | 10Hz   | Average Value |                  |
|                       | <div>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</div> <div>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div> |            |        |               |                  |

**Test setup:**

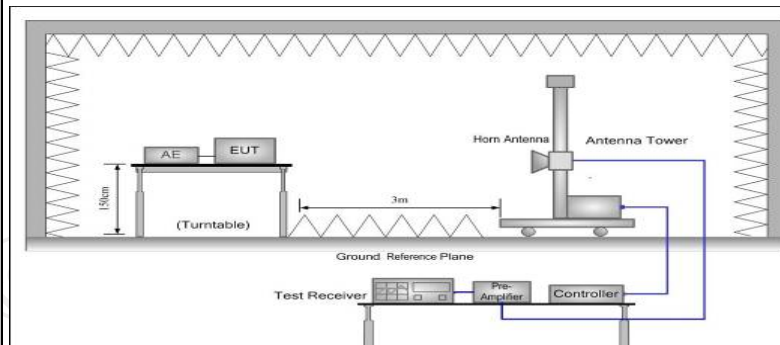
For radiated emissions below 30MHz



30MHz to 1GHz



Above 1GHz



**Test Mode:**

Transmitting Mode

**Test results:**

PASS

### 6.3.2. Limit

| Fundamental Frequency (MHz) | Filed Strength of Fundamental (microvolts/meter) | Filed Strength of Spurious Emission (microvolts/meter) |
|-----------------------------|--------------------------------------------------|--------------------------------------------------------|
| 40.66-40.70                 | 1000                                             | 100                                                    |
| 70-130                      | 500                                              | 50                                                     |
| 130-174                     | 500 to 1500*                                     | 50 to 150*                                             |
| 174-260                     | 1500                                             | 150                                                    |
| 260-470                     | 1500 to 5000*                                    | 150 to 500*                                            |
| Above 470                   | 5000                                             | 500                                                    |

\*Linear interpolations

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

For the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $22.7273(F) - 2454.5455$ ;

for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $16.6667(F) - 2833.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

### For EUT

| Fundamental Frequency (MHz) | Filed Strength of Fundamental (microvolts/meter) | Filed Strength of Spurious Emission(dB $\mu\text{V/m}$ ) |
|-----------------------------|--------------------------------------------------|----------------------------------------------------------|
| 433.92                      | 72.87                                            | 52.87                                                    |

**Note:**

1. Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions.
2. According to 15.35, on any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test.
3. According to 15.231(b), The limits on the field strength of the spurious emissions in the above table is 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 Section 15.209, whichever limit permits one higher field strength.

**Frequencies in restricted band are complied to limit on Paragraph 15.209**

| Frequency Range (MHz) | Distance (m) | Field strength (dB $\mu$ V/m) |
|-----------------------|--------------|-------------------------------|
| 0.009-0.490           | 3            | 20log 2400/F (kHz) + 80       |
| 0.490-1.705           | 3            | 20log 24000/F (kHz) + 40      |
| 1.705-30              | 3            | 20log 30 + 40                 |
| 30-88                 | 3            | 40.0                          |
| 88-216                | 3            | 43.5                          |
| 216-960               | 3            | 46.0                          |
| Above 960             | 3            | 54.0                          |

**Note:**

1. RF Voltage (dBuV) = 20 log RF Voltage ( $\mu$ V)
2. In the 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 EUT
4. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
5. If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula  $Ld1 = Ld2 * (d2/d1)$

### 6.3.3. Test Instruments

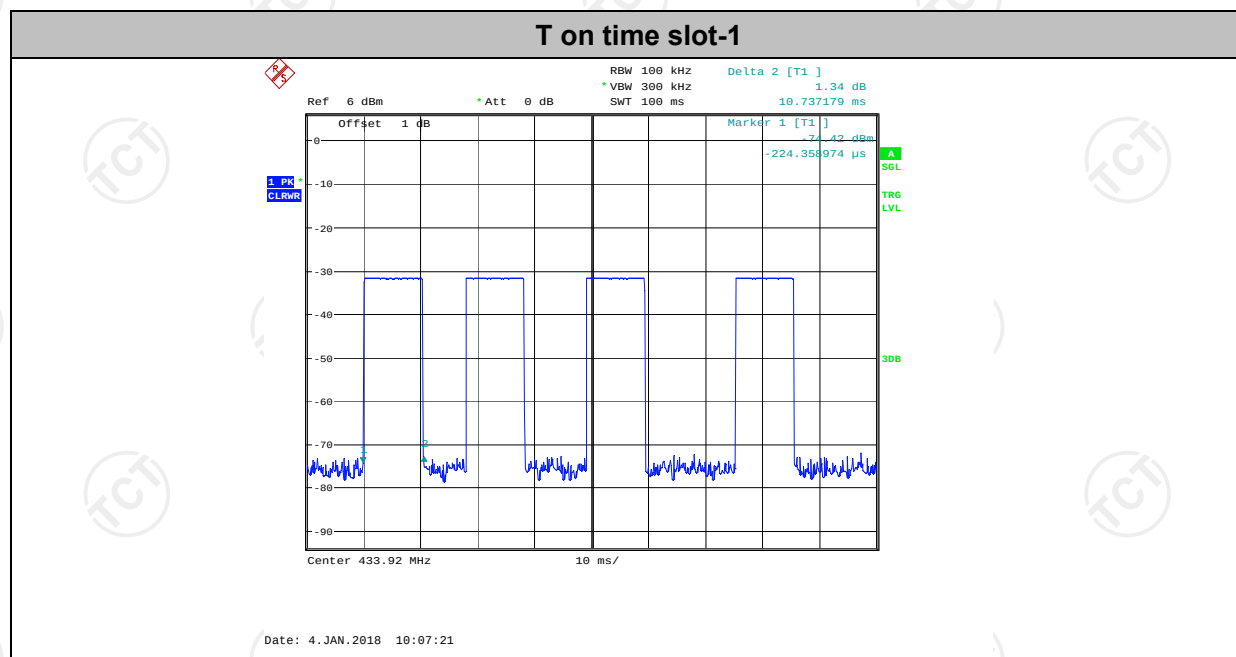
| Radiated Emission Test Site (966) |                                    |            |               |                 |
|-----------------------------------|------------------------------------|------------|---------------|-----------------|
| Name of Equipment                 | Manufacturer                       | Model      | Serial Number | Calibration Due |
| Test Receiver                     | ROHDE&SCHW ARZ                     | ESVD       | 100008        | Sep. 27, 2018   |
| Spectrum Analyzer                 | ROHDE&SCHW ARZ                     | FSQ        | 200061        | Sep. 27, 2018   |
| Pre-amplifier                     | EM Electronics Corporation CO.,LTD | EM30265    | 07032613      | Sep. 27, 2018   |
| Pre-amplifier                     | HP                                 | 8447D      | 2727A05017    | Sep. 27, 2018   |
| Loop antenna                      | ZHINAN                             | ZN30900A   | 12024         | Sep. 27, 2018   |
| Broadband Antenna                 | Schwarzbeck                        | VULB9163   | 340           | Sep. 27, 2018   |
| Horn Antenna                      | Schwarzbeck                        | BBHA 9120D | 631           | Sep. 27, 2018   |
| Horn Antenna                      | Schwarzbeck                        | BBH 9170   | 582           | Jun. 07, 2018   |
| Antenna Mast                      | Keleto                             | CC-A-4M    | N/A           | N/A             |
| Coax cable (9KHz-1GHz)            | TCT                                | RE-low-01  | N/A           | Sep. 27, 2018   |
| Coax cable (9KHz-40GHz)           | TCT                                | RE-high-02 | N/A           | Sep. 27, 2018   |
| Coax cable (9KHz-1GHz)            | TCT                                | RE-low-03  | N/A           | Sep. 27, 2018   |
| Coax cable (9KHz-40GHz)           | TCT                                | RE-high-04 | N/A           | Sep. 27, 2018   |
| EMI Test Software                 | Shurple Technology                 | EZ-EMC     | N/A           | N/A             |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.3.4. Test Data

### Duty Cycle Test Data:

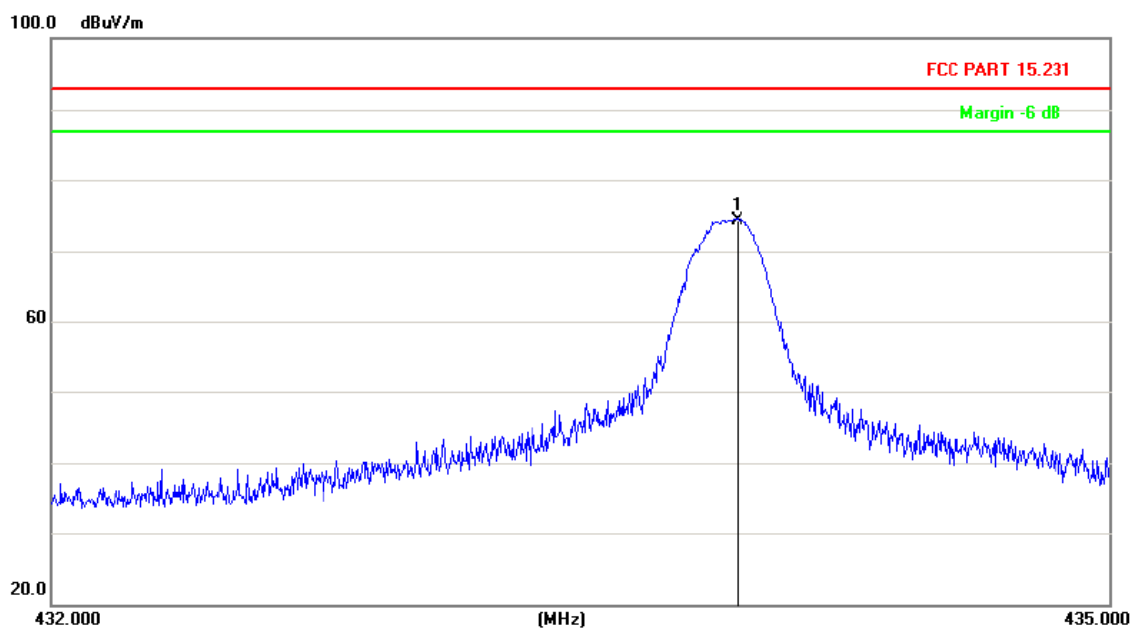
| Total time (ms)                                                                                                                                                                                                       | 100 (ms) | Duty Cycle | AV Factor(dB) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|---------------|
| 42.96                                                                                                                                                                                                                 | 100      | 0.4296     | -7.34         |
| <b>Note:</b> Duty Cycle= Duty cycle = Ton time/100 milliseconds or period, whichever is less<br>Ton time = 10.74*4(ms) =42.96(ms), T period =100ms<br>So, Duty cycle = 42.96%<br>AV Factor = 20 log(Duty Cycle)=-7.34 |          |            |               |



## Field Strength of Fundamental

| Frequency (MHz) | Emission PK (dBuV/m) | Horizontal /Vertical | Limits PK (dBuV/m) | Margin (dB) |
|-----------------|----------------------|----------------------|--------------------|-------------|
| 433.92          | 74.25                | H                    | 92.87              | -18.62      |
| 433.92          | 71.31                | V                    | 92.87              | -21.56      |

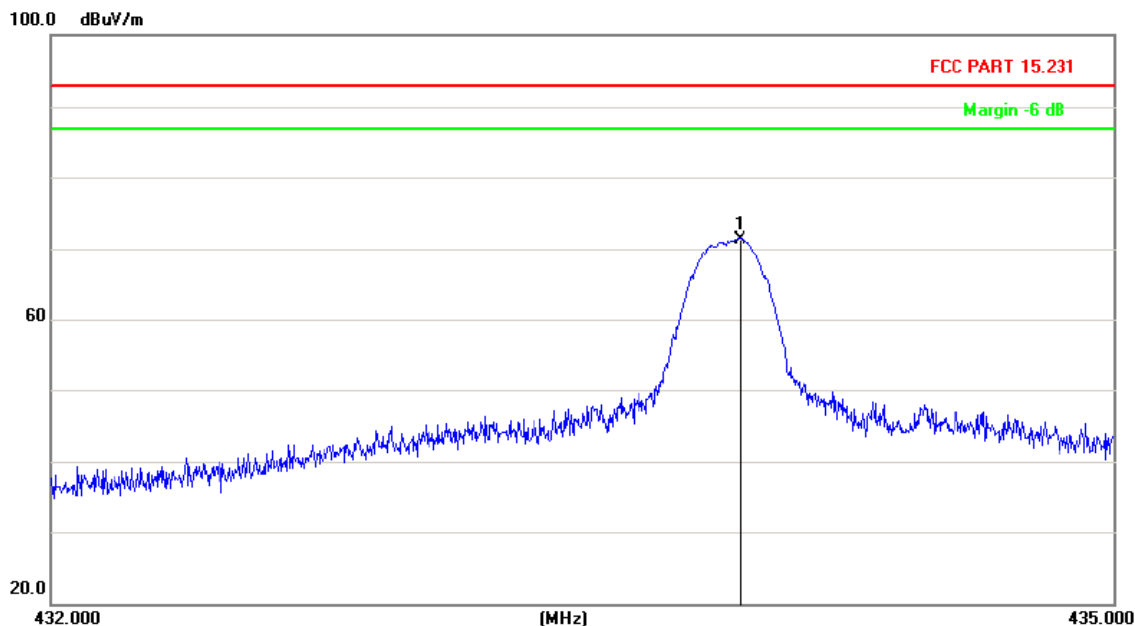
| Frequency (MHz) | Emission PK (dBuV/m) | AV Factor(dB) | Horizontal /Vertical | Emission AVG (dBuV/m) | Limits AV (dBuV/m) | Margin (dB) |
|-----------------|----------------------|---------------|----------------------|-----------------------|--------------------|-------------|
| 433.92          | 74.25                | -7.34         | H                    | 66.91                 | 72.87              | -5.96       |
| 433.92          | 71.31                | -7.34         | V                    | 63.97                 | 72.87              | -8.9        |



|                        |                                 |                 |
|------------------------|---------------------------------|-----------------|
| Site                   | Polarization: <b>Horizontal</b> | Temperature: 25 |
| Limit: FCC PART 15.231 | Power: DC 3V                    | Humidity: 55 %  |

| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit | Over   | Antenna Height | Table Degree |                |
|-----|-----|----------|---------------|----------------|--------------|-------|--------|----------------|--------------|----------------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dB/m  | dB     | Detector       | cm           | degree Comment |
| 1   | *   | 433.9415 | 79.13         | -4.88          | 74.25        | 92.87 | -18.62 | peak           |              |                |





Site Polarization: **Vertical** Temperature: 25  
 Limit: FCC PART 15.231 Power: DC 3V Humidity: 55 %

| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|-------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dB/m  | dB     | cm             | degree       | Comment |
| 1   | *   | 433.9415 | 76.19         | -4.88          | 71.31       | 92.87 | -21.56 | peak           |              |         |

## Harmonics and Spurious Emissions

### Frequency Range (9 kHz-30MHz)

| Frequency (MHz)                                                                                                                                    | Level@3m (dBuV/m) | Limit@3m (dBuV/m) |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|
| Remark: The margin for All level in this frequency band is > 20dB form Limit, so not listed in report. It is deemed to comply with the requirement |                   |                   |

**Note:** 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

## Frequency Range (30MHz–5GHz)

| Frequency (MHz) | Emission Level@3m (dBμV/m) | Antenna Polarity | Limit@3m (dBμV/m) | Remark | Result |
|-----------------|----------------------------|------------------|-------------------|--------|--------|
| 408.95          | 30.21                      | H                | 46.0              | QP     | PASS   |
| 867.84          | 39.85                      | H                | 52.87             | QP     | PASS   |
| 1301.76         | 53.97                      | H                | 74.0              | Peak   | PASS   |
| 1735.68         | 50.42                      | H                | 74.0              | Peak   | PASS   |
| 81.21           | 27.86                      | V                | 40.0              | QP     | PASS   |
| 867.84          | 35.58                      | V                | 52.87             | QP     | PASS   |
| 1301.76         | 56.71                      | V                | 74.0              | Peak   | PASS   |
| 1735.68         | 50.46                      | V                | 74.0              | Peak   | PASS   |

| Frequency (MHz) | Peak Emission Level@3m (dBμV/m) | AV Factor (dB) | Antenna Polarity | AV Emission Level@3m (dBμV/m) | Limit@3m (dBμV/m) | Result |
|-----------------|---------------------------------|----------------|------------------|-------------------------------|-------------------|--------|
| 1301.76         | 53.97                           | -7.34          | H                | 46.63                         | 54.0              | PASS   |
| 1735.68         | 50.42                           | -7.34          | H                | 43.08                         | 54.0              | PASS   |
| 1301.76         | 56.71                           | -7.34          | V                | 49.37                         | 54.0              | PASS   |
| 1735.68         | 50.46                           | -7.34          | V                | 43.12                         | 54.0              | PASS   |

**Note:** Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor  
 AV=Average  
 AV Emission level = Peak Emissions level +AV Factor

## 6.4. Occupied Bandwidth

### 6.4.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part15 C Section 15.215(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Test Method:</b>      | ANSI C63.10: 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Limit:</b>            | According to 15.231(c), 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.                                                                                                                                                                                                                                                                                           |
|                          | <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 to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.<br/>Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW <math>\geq</math> 1% of the 20 dB bandwidth; VBW <math>\geq</math> RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>4. Measure and record the results in the test report.</li> </ol> |
| <b>Test setup:</b>       |  <p>The diagram illustrates the test setup. On the left is a green Spectrum Analyzer with a screen and two knobs. A cable connects it to a yellow rectangular box on the right labeled 'EUT' (Equipment Under Test).</p>                                                                                                                                                                                                                                                                                                                                   |
| <b>Test Mode:</b>        | Transmitting Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Test results:</b>     | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

### 6.4.2. Test Instruments

| RF Test Room      |              |       |               |                 |
|-------------------|--------------|-------|---------------|-----------------|
| Equipment         | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | R&S          | FSU   | 200054        | Sep. 27, 2018   |

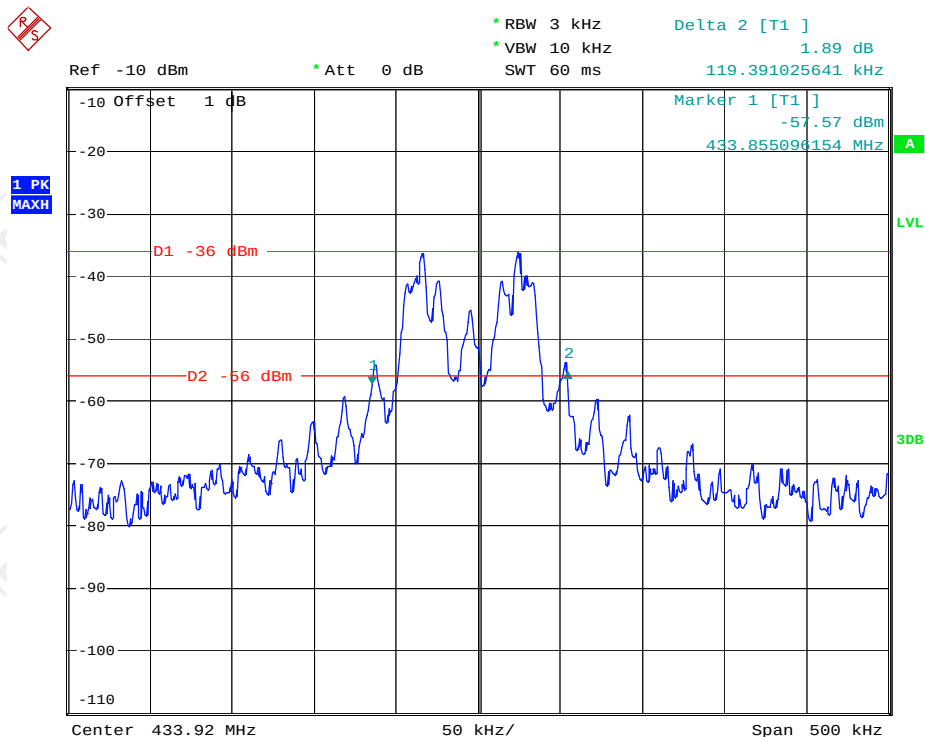
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## 6.4.3. Test data

| Test Frequency(MHz) | 20dB Occupy Bandwidth (kHz) | Limit (kHz) | Conclusion |
|---------------------|-----------------------------|-------------|------------|
| 433.92              | 119.39                      | 1084.8      | PASS       |

**Note:** Limit = 433.92MHz \*0.25% = 1084.8 kHz

Test plots as follows:



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## 6.5. Transmission time and silent time

### 6.5.1. Test Specification

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test Requirement:</b> | FCC Part15 C Section 15.231(e)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Test Method:</b>      | ANSI C63.10: 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Limit:</b>            | According to 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.                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                          | <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 to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Use the following spectrum analyzer settings.<br/>For transmission time:<br/>Span = 0MHz, centered on a declared channel;<br/>RBW=100kHz; VBW<math>\geq</math>3RBW; Sweep = 1s; Detector function = peak, record the transmission time.<br/>For silent time:<br/>Span = 0MHz, centered on a declared channel;<br/>RBW=100kHz; VBW <math>\geq</math> 3RBW; Sweep = as necessary to capture at least two periodic time;<br/>Detector function = peak, record the silent time.</li> <li>4. Measure and record the results in the test report.</li> </ol> |
| <b>Test setup:</b>       |  <p>The diagram illustrates the test setup. On the left is a green Spectrum Analyzer with a screen and two knobs. A cable connects it to a yellow rectangular box on the right labeled 'EUT'.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Test Mode:</b>        | Transmitting Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Test results:</b>     | PASS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

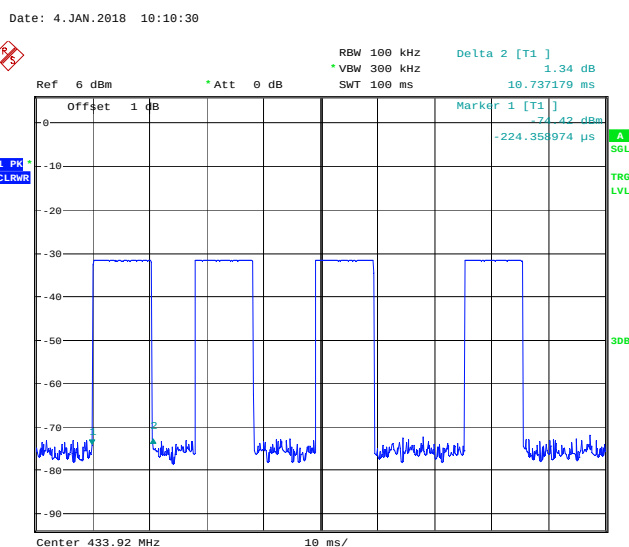
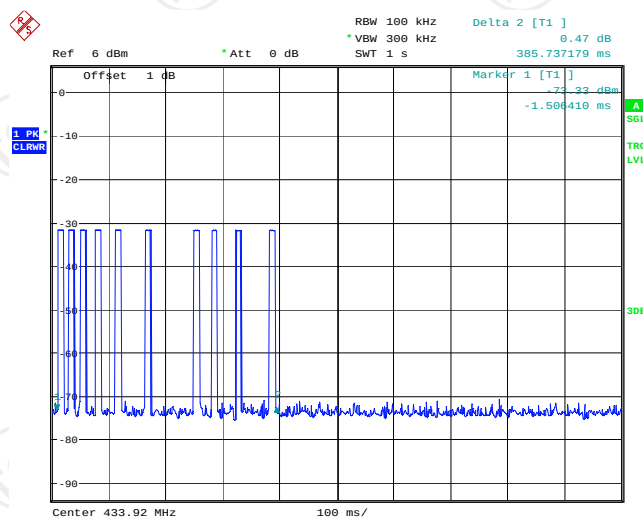
### 6.5.2. Test Instruments

| RF Test Room      |              |       |               |                 |
|-------------------|--------------|-------|---------------|-----------------|
| Equipment         | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | R&S          | FSU   | 200054        | Sep. 27, 2018   |

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

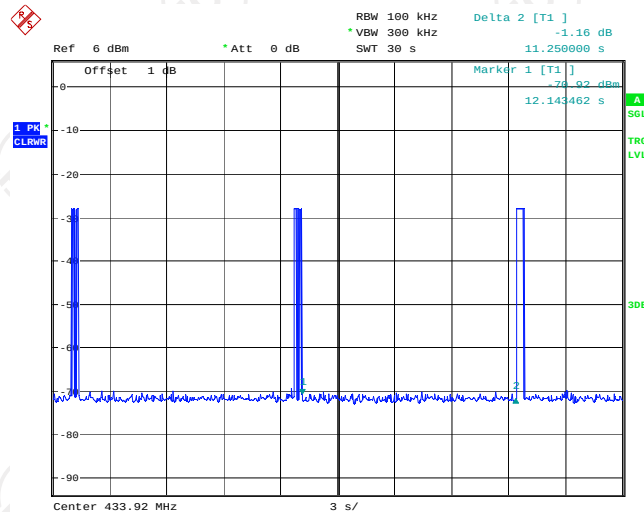
## 6.5.3. Test data

| Channel Frequency (MHz) | Pulse Width (ms) | Number of Pulse | Transmission Time (s) | Limit (s) | Test conclusion |
|-------------------------|------------------|-----------------|-----------------------|-----------|-----------------|
| 433.92                  | 10.74            | 10              | 0.1074                | <1s       | PASS            |



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| Channel Frequency (MHz) | Silent Period (s) | Limit 30 Times Of The Transmission Time (s) | Limit (s) | Test conclusion |
|-------------------------|-------------------|---------------------------------------------|-----------|-----------------|
| 433.92                  | 11.25             | 3.22                                        | >10s      | PASS            |



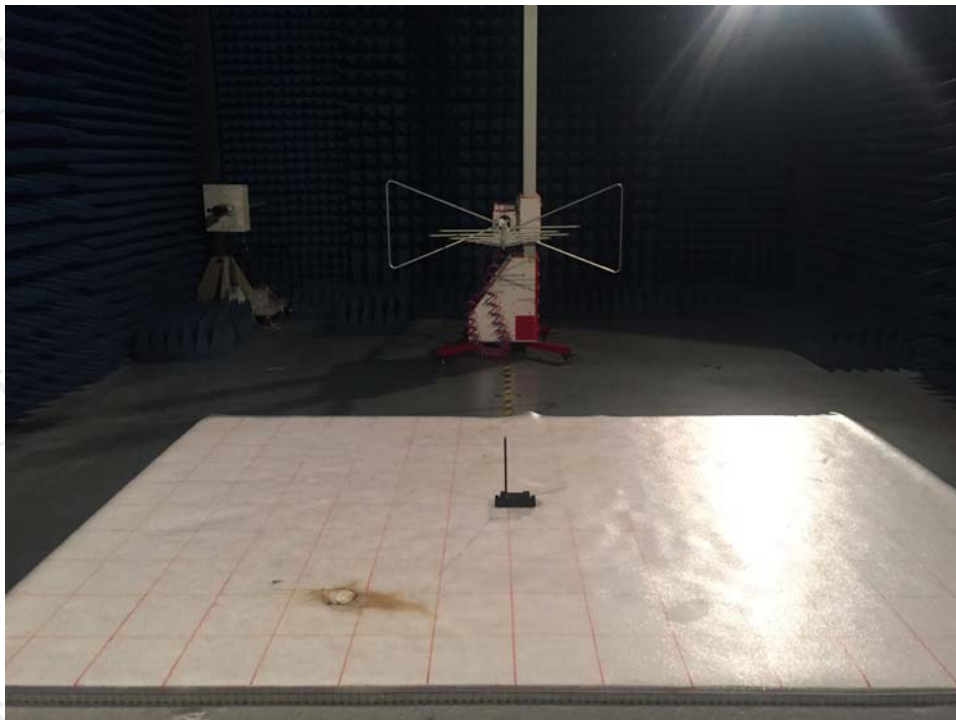
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## Appendix A: Photographs of Test Setup

Product: Internal sensor

Model: TN200

Radiated Emission





**Appendix B: Photographs of EUT**  
**Product: Internal sensor**  
**Model: TN200**  
**External Photos**



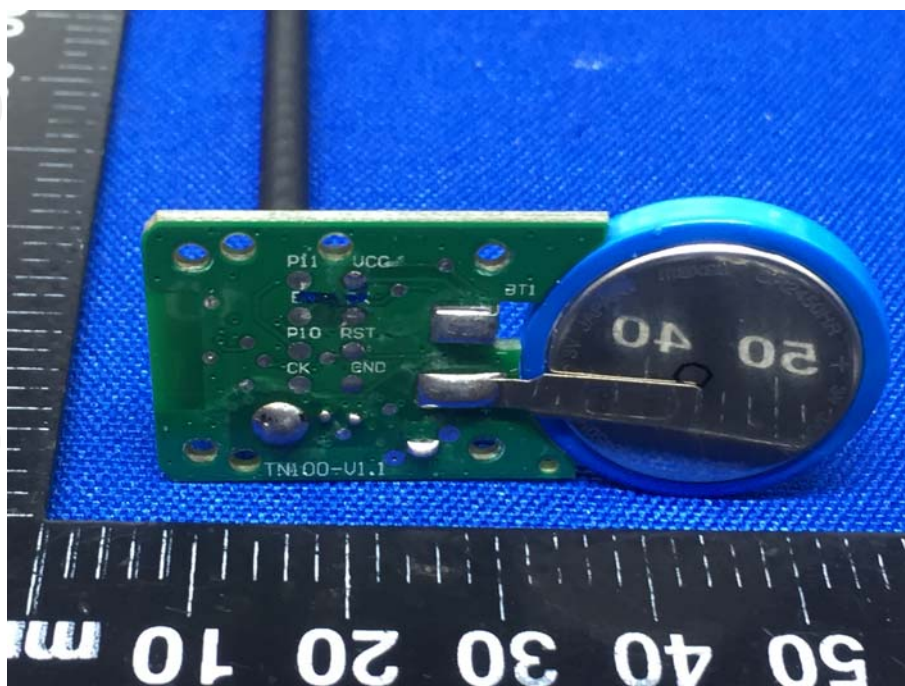
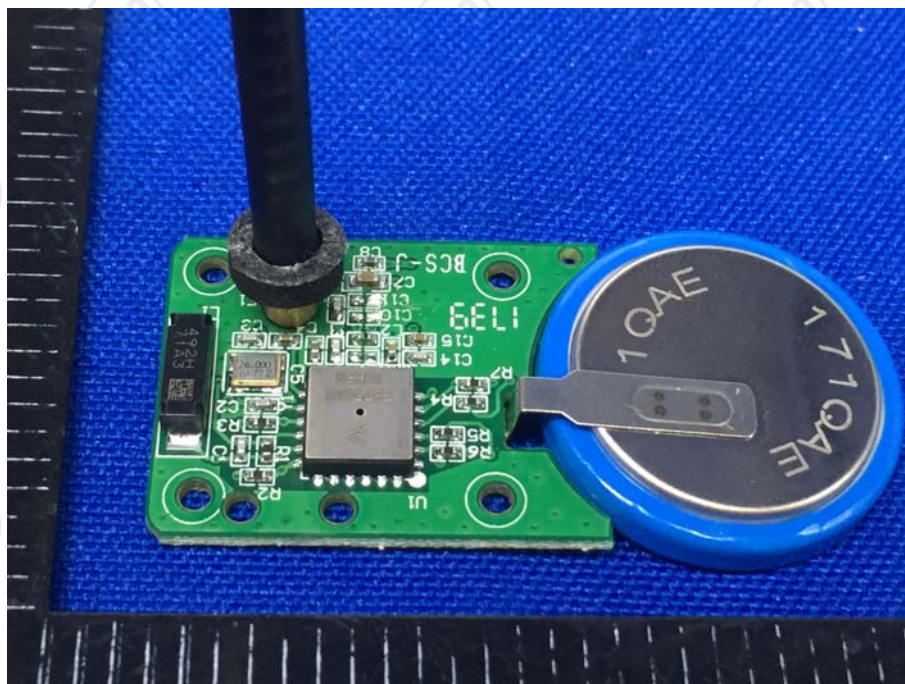






**Product: Internal sensor**  
**Model: TN200**  
**Internal Photos**





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