LTA
Laboratory for Test & Approval Co.,Ltd.

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Tel: +82-31-323-6008 Fax: +82-31-323-6010
http://www.ltalab.com

Dates of Tests: April 01, 2019 ~ April 24, 2019
Test Report S/N: LR500111904S
Test Site : LTA CO., LTD.

# CERTIFICATION OF COMPLIANCE

FCC ID. **W6YPT400TWR**

APPLICANT **PASSTECH CO., LTD.**

| | | |
|---|---|---|
| **Equipment Class** | **:** | **Part 15 – Radio Frequency Devices** |
| **Manufacturing Description** | **:** | **LOCKER LOCK** |
| **Manufacturer** | **:** | **PASSTECH CO., LTD.** |
| **Model name** | **:** | **PT400TWR** |
| **Varient Model name** | **:** | **PT200TWR, PT600TWR** |
| **Test Device Serial No.:** | **:** | **Identical prototype** |
| **Rule Part(s)** | **:** | **FCC Part 15 Subpart C ; ANSI C-63.10-2013** |
| **Frequency Range** | **:** | **13.56 MHz** |
| **Date of issue** | **:** | **April 24, 2019** |

This test report is issued under the authority of:

JaBeom, Koo / Manager

The test was supervised by:

HeeCheon Kwon, Test Engineer

**This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.**

NVLAP LAB Code.: 200723-0

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# 1. General information

## 1-1 Test Performed


Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 17159

Web site : http://www.ltalab.com

E-mail : chahn@ltalab.com

Telephone : +82-31-323-6008

Facsimile +82-31-323-6010


Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

## 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

| Agency | Country | Accreditation No. | Validity | Reference |
|---|---|---|---|---|
| NVLAP | U.S.A | 200723-0 | 2019-09-30 | ECT accredited Lab. |
| RRA | KOREA | KR0049 | - | EMC accredited Lab. |
| FCC | U.S.A | 649054 | Updating | FCC CAB |
| VCCI | JAPAN | C-4948,<br>T-2416,<br>R-4483(10 m),<br>G-847 | 2020-09-10<br>2020-09-10<br>2020-10-15<br>2022-06-13 | VCCI registration |
| IC | CANADA | 5799A-1 | 2019-11-07 | IC filing |
| KOLAS | KOREA | NO.551 | 2021-08-20 | KOLAS accredited Lab. |

# 2. Information about test item

## 2-1 Client & Manufacturer

| | | |
|---|---|---|
| Company name | : | PASSTECH CO., LTD. |
| Address | : | #1305 Kranz Techno, 5442-1, Sangdaewon-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do, South Korea |
| Tel / Fax | : | +82-31-743-7277 / +82-31-743-7276 |

## 2-2 Equipment Under Test (EUT)

| | | |
|---|---|---|
| Model name | : | PT400TWR |
| Varient Model name | : | PT200TWR, PT600TWR |
| Serial number | : | Identical prototype |
| Date of receipt | : | April 01, 2019 |
| EUT condition | : | Pre-production, not damaged |
| Antenna type | : | Loop Antenna |
| Frequency Range | : | 13.56 MHz |
| Power Source | : | 6.0 Vdc |

## 2-3 Tested frequency

| | LOW | MID | HIGH |
|---|---|---|---|
| **Frequency (MHz)** | - | 13.56 | - |

## 2-4 Ancillary Equipment

| Equipment | Model No. | Serial No. | Manufacturer |
|---|---|---|---|
| - | - | - | - |

# 3. Test Report

## 3.1 Summary of tests

| FCC Part Section(s) | Parameter | Test Condition | Status (note 1) |
|---|---|---|---|
| 15.225 | OCCUPIED BANDWIDTH | Radiation | C |
| 15.209 | Radiated Emission | | C |
| 15.207 | Conducted Emission | | C |
| 15.225 (e) | Frequency Stability | | C |

The above equipment was tested by LTA Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15 The test results of this report relate only to the tested sample identified in this report.

FCC 15.203 Antenna Requirement

The equipment and its antenna comply with this requirement since the antenna is built in the equipment and it cannot be replaced by end users.

### 3.2 EUT measurements

1. **In order to establish the maiximum radiation, firstly, there have been viewed all orthogonal dajustments of the test samples, secondly the test ample have been rotated at all adjustments around the own axis betwwen 0°**and 360°, and thirdly, the antenna polarization between horizontal and vertical had been varied.

2. **Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 10m open field test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlated with the one of tests made in an open field site based on KDB 414788.**

3. **The test was measured in the most Worst Case Without Tag state compared to the With Tag and Without Tag states.**

## 3.3 Technical Characteristics Test

## 3.3.1 OCCUPIED BANDWIDTH

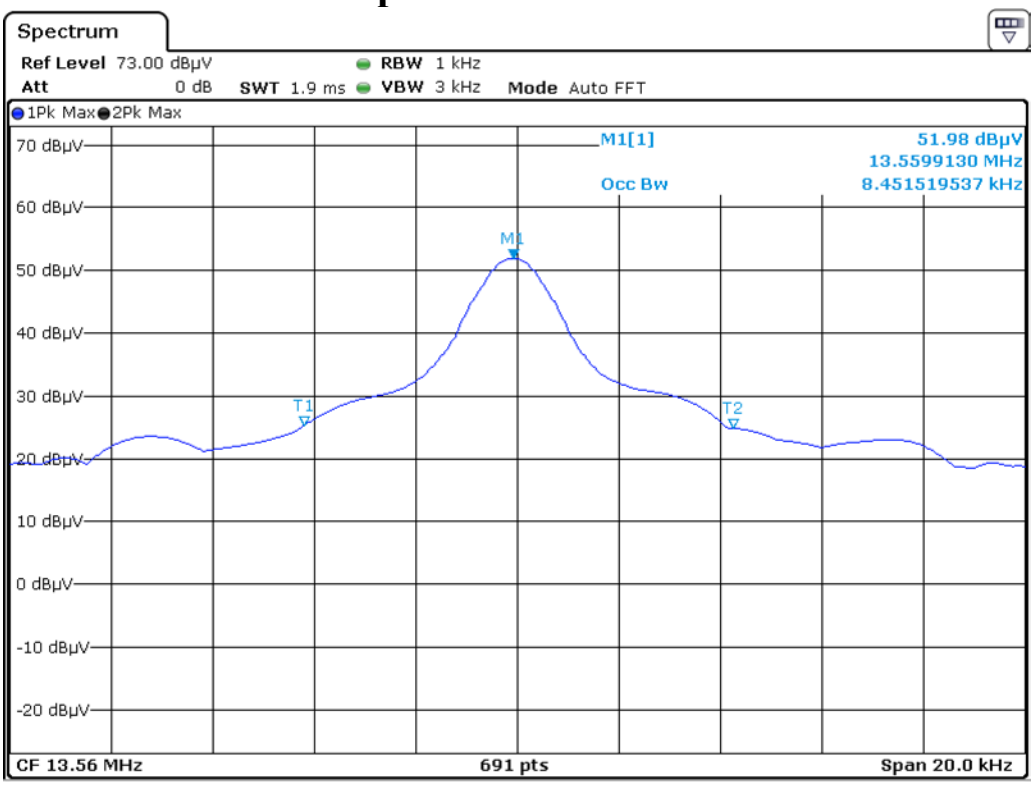
### TEST PROCEDURE

**Type A with highet data rate. The transmitter output is connected to the spectrum analyzer. The RBW is set to 10kHz. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.**

**Note: Because the measured signal is CW or CW-like adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW**

**Measurement Data : Complies**

# 99% Occupied Bandwidth : 8.45 kHz




Date: 22.APR.2019 14:00:31

## 3.3.2 RADIATED EMISSION TEST RESULTS

## LIMITS AND PROCEDURE

**(a) The field strength of any emissions within the band 13.553−13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.**

**(b) Within the bands 13.410−13.553 MHz and 13.567−13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.**

**(c) Within the bands 13.110−13.410 MHz and 13.710−14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.**

**(d) The field strength of any emissions appearing outside of the 13.110− 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:**

**§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:**

| Frequency (MHz) | Field Strength (uV/m) | Measurement distance (m) |
|---|---|---|
| 0.009 – 0.490 | 2 400/F(kHz) | 300 |
| 0.490 – 1.705 | 24 000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 – 960 | 200 | 3 |
| Above 960 | 500 | 3 |

**** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.**

**§15.209 (b) In the emission table above, the tighter limit applies at the band edges.**

**Formula for converting the filed strength from uV/m to dBuV/m is:**

**Limit (dBuV/m) = 20 log limit (uV/m)**

**In addition:**

**§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.**

**§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.**

## TEST PROCEDURE

**ANSI C63.10, 2013**

**The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10th harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.**

**Measurement Data : Complies**

**Figure 1. Direction of the Loop Antenna**

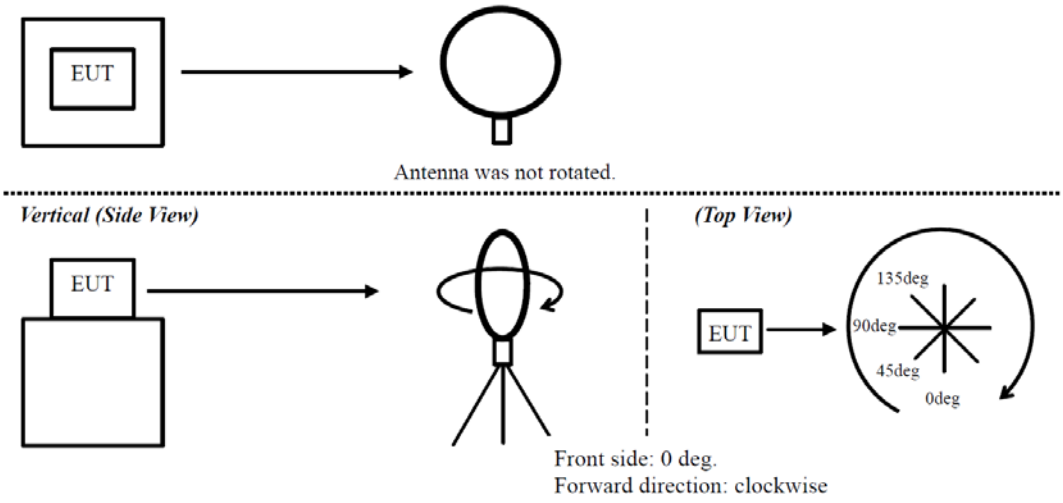
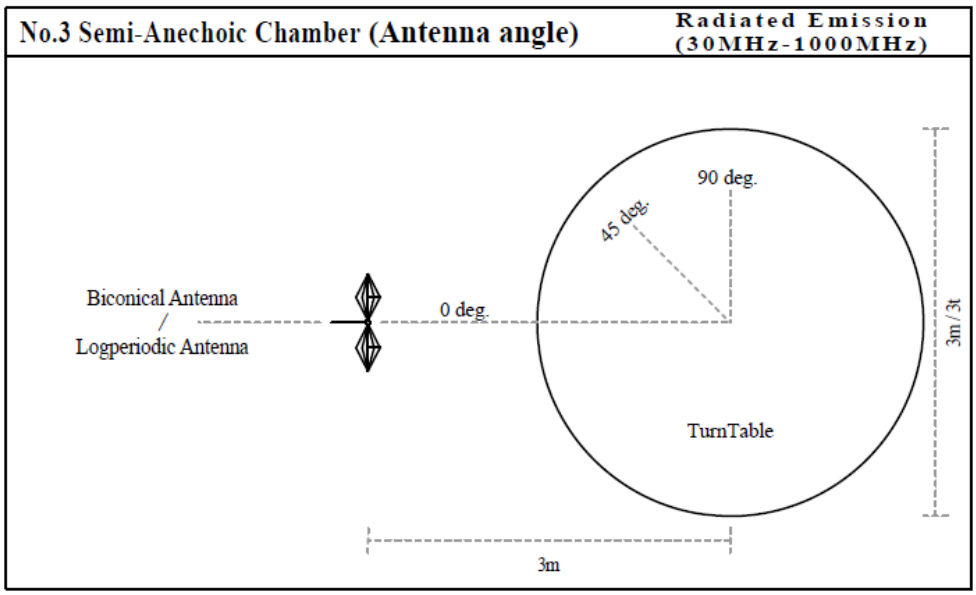



**Figure 2. Antenna angle**



- **DATA_FUNDAMENTAL**

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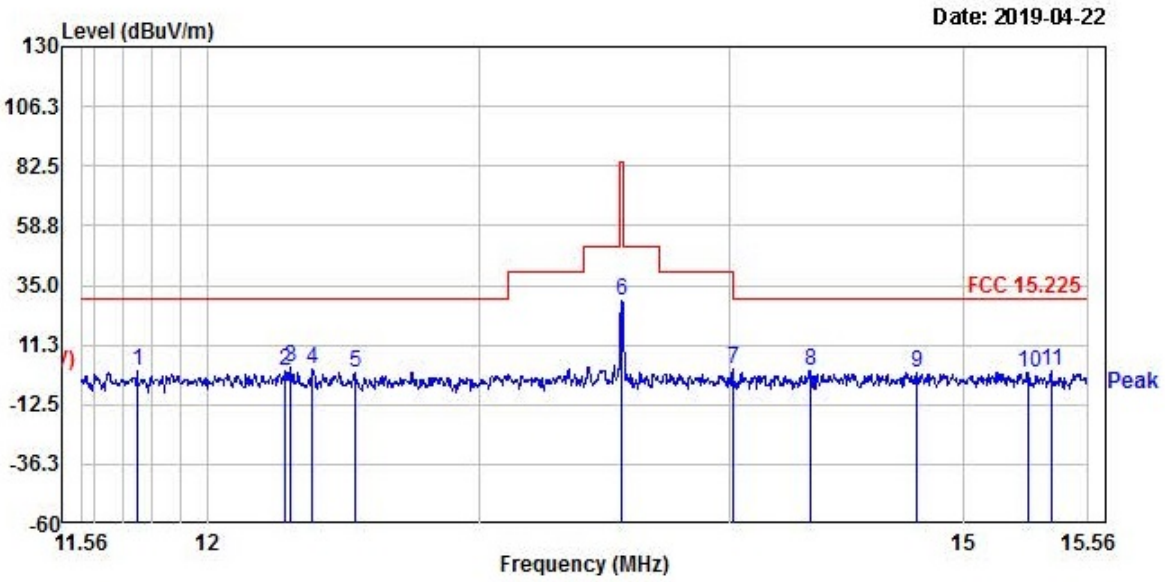
EUT/Model No.: PT400TWR  Temp/Humi: 23 / 36

Test Mode : RFID mode  Tested by: Kwon H C




| Freq | Reading | C.F | Result QP | Limit | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | deg | |
| 11.75 | 19.83 | -19.01 | 0.82 | 29.54 | 28.72 | ------ | ------ | --------- |
| 12.28 | 19.98 | -18.92 | 1.06 | 29.54 | 28.48 | ------ | ------ | --------- |
| 12.29 | 21.16 | -18.92 | 2.24 | 29.54 | 27.30 | ------ | ------ | --------- |
| 12.38 | 20.55 | -18.90 | 1.65 | 29.54 | 27.89 | ------ | ------ | --------- |
| 12.53 | 19.45 | -18.87 | 0.58 | 29.54 | 28.96 | ------ | ------ | --------- |
| 13.56 | 47.76 | -18.69 | 29.07 | 84.00 | 54.93 | ------ | ------ | --------- |
| 14.01 | 20.20 | -18.61 | 1.59 | 29.54 | 27.95 | ------ | ------ | --------- |
| 14.34 | 19.61 | -18.56 | 1.05 | 29.54 | 28.49 | ------ | ------ | --------- |
| 14.79 | 19.06 | -18.48 | 0.58 | 29.54 | 28.96 | ------ | ------ | --------- |
| 15.29 | 18.80 | -18.37 | 0.43 | 29.54 | 29.11 | ------ | ------ | --------- |
| 15.39 | 19.22 | -18.35 | 0.87 | 29.54 | 28.67 | ------ | ------ | --------- |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

**Note : Dist Corr 30 m = -40 dB**

-

- **DATA_FUNDAMENTAL**

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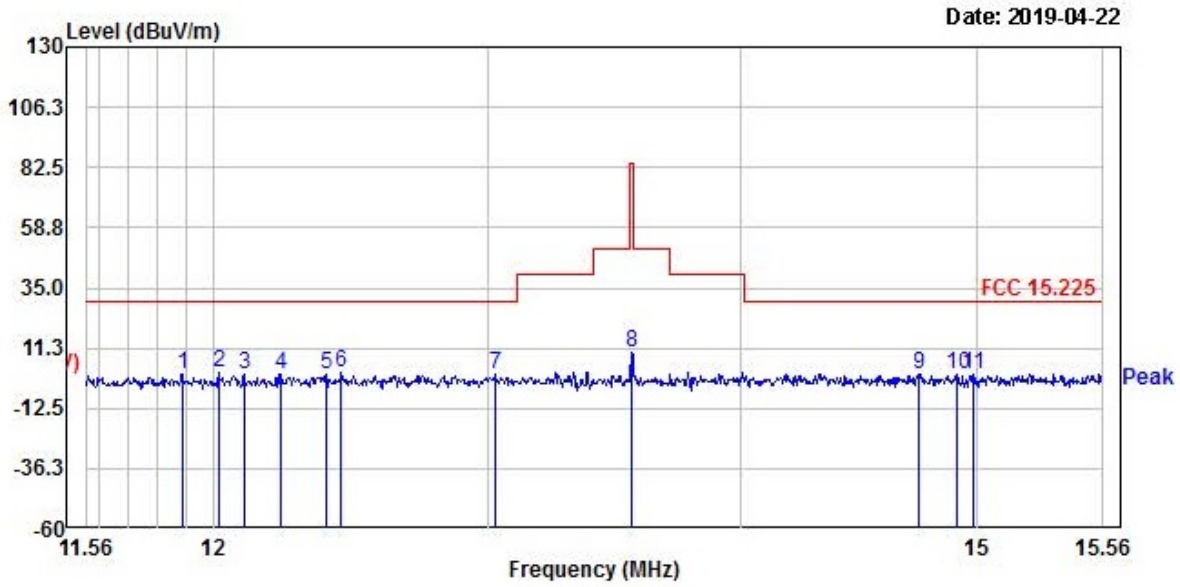
EUT/Model No.: PT400TWR  Temp/Humi: 23 / 36
Test Mode : RFID mode  Tested by: Kwon H C




| Freq | Reading | C.F | Result QP | Limit | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | deg | |
| 11.89 | 19.99 | -18.99 | 1.00 | 29.54 | 28.54 | ------ | ------ | --------- |
| 12.02 | 20.56 | -18.97 | 1.59 | 29.54 | 27.95 | ------ | ------ | --------- |
| 12.10 | 19.98 | -18.95 | 1.03 | 29.54 | 28.51 | ------ | ------ | --------- |
| 12.24 | 19.99 | -18.93 | 1.06 | 29.54 | 28.48 | ------ | ------ | --------- |
| 12.40 | 19.99 | -18.90 | 1.09 | 29.54 | 28.45 | ------ | ------ | --------- |
| 12.46 | 20.20 | -18.89 | 1.31 | 29.54 | 28.23 | ------ | ------ | --------- |
| 13.03 | 19.84 | -18.79 | 1.05 | 29.54 | 28.49 | ------ | ------ | --------- |
| 13.56 | 28.59 | -18.69 | 9.90 | 84.00 | 74.10 | ------ | ------ | --------- |
| 14.75 | 19.45 | -18.48 | 0.97 | 29.54 | 28.57 | ------ | ------ | --------- |
| 14.91 | 19.61 | -18.46 | 1.15 | 29.54 | 28.39 | ------ | ------ | --------- |
| 14.98 | 19.45 | -18.44 | 1.01 | 29.54 | 28.53 | ------ | ------ | --------- |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

**Note : Dist Corr 30 m = -40 dB**

- **DATA_TX SPURIOUS EMISSION Below 30**

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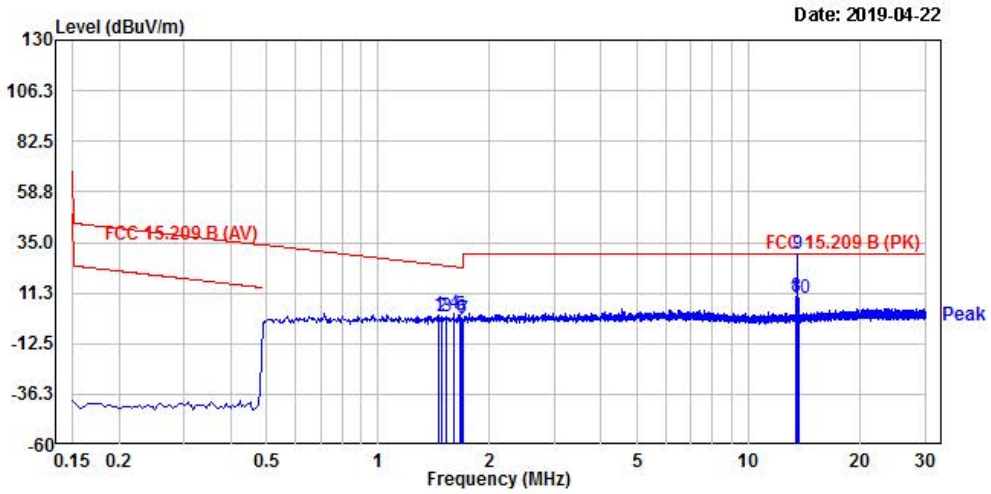
EUT/Model No.: PT400TWR  Temp/Humi: 23 / 36
Test Mode : RFID mode  Tested by: Kwon H C




| Freq | Reading | C.F | Result QP | Limit | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | deg | |
| 1.46 | 19.99 | -19.14 | 0.85 | 24.34 | 23.49 | ------ | ------ | vertical |
| 1.49 | 19.46 | -19.13 | 0.33 | 24.12 | 23.79 | ------ | ------ | vertical |
| 1.53 | 19.05 | -19.11 | -0.06 | 23.89 | 23.95 | ------ | ------ | vertical |
| 1.61 | 20.56 | -19.09 | 1.47 | 23.49 | 22.02 | ------ | ------ | vertical |
| 1.66 | 19.99 | -19.07 | 0.92 | 23.20 | 22.28 | ------ | ------ | vertical |
| 1.69 | 18.37 | -19.06 | -0.69 | 23.06 | 23.75 | ------ | ------ | vertical |
| 1.69 | 18.19 | -19.06 | -0.87 | 23.02 | 23.89 | ------ | ------ | vertical |
| 13.47 | 28.26 | -18.71 | 9.55 | 29.50 | 19.95 | ------ | ------ | vertical |
| 13.56 | 47.96 | -18.69 | 29.27 | 29.50 | 0.23 | ------ | ------ | vertical |
| 13.63 | 27.52 | -18.68 | 8.84 | 29.50 | 20.66 | ------ | ------ | vertical |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



**Note : Marker 9 is the fundamental Signal**

- **DATA_TX SPURIOUS EMISSION Below 30**

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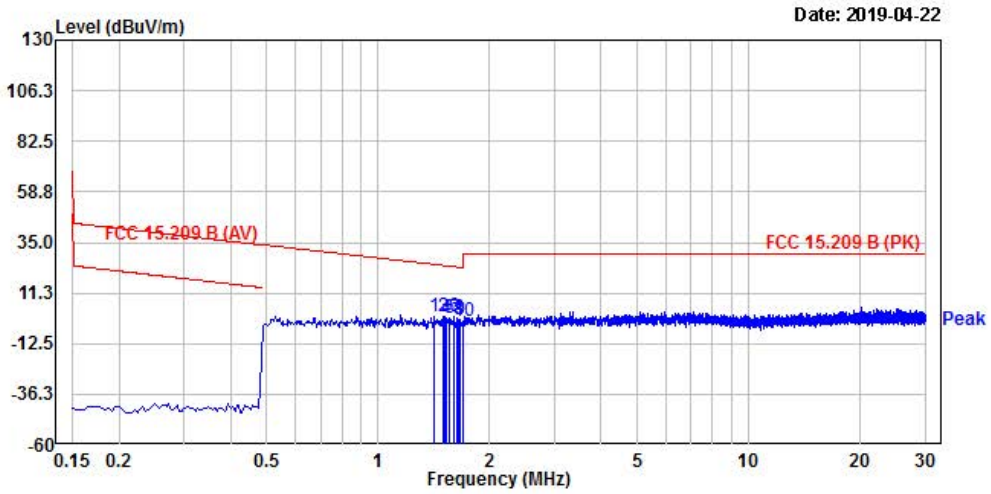
EUT/Model No.: PT400TWR  Temp/Humi: 23 / 36

Test Mode : RFID mode  Tested by: Kwon H C




| Freq | Reading | C.F | Result QP | Limit | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | deg | |
| 1.41 | 19.06 | -19.15 | -0.09 | 24.59 | 24.68 | ------ | ------ | vertical |
| 1.50 | 19.06 | -19.13 | -0.07 | 24.10 | 24.17 | ------ | ------ | vertical |
| 1.51 | 19.21 | -19.11 | 0.10 | 24.04 | 23.94 | ------ | ------ | vertical |
| 1.53 | 18.37 | -19.11 | -0.74 | 23.93 | 24.67 | ------ | ------ | vertical |
| 1.56 | 18.80 | -19.10 | -0.30 | 23.72 | 24.02 | ------ | ------ | vertical |
| 1.60 | 19.22 | -19.09 | 0.13 | 23.51 | 23.38 | ------ | ------ | vertical |
| 1.64 | 18.37 | -19.08 | -0.71 | 23.33 | 24.04 | ------ | ------ | vertical |
| 1.65 | 18.19 | -19.07 | -0.88 | 23.25 | 24.13 | ------ | ------ | vertical |
| 1.67 | 17.73 | -19.07 | -1.34 | 23.16 | 24.50 | ------ | ------ | vertical |
| 1.70 | 17.23 | -19.05 | -1.82 | 22.98 | 24.80 | ------ | ------ | vertical |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



- **DATA_TX SPURIOUS EMISSION 30 TO 1000 MHz**

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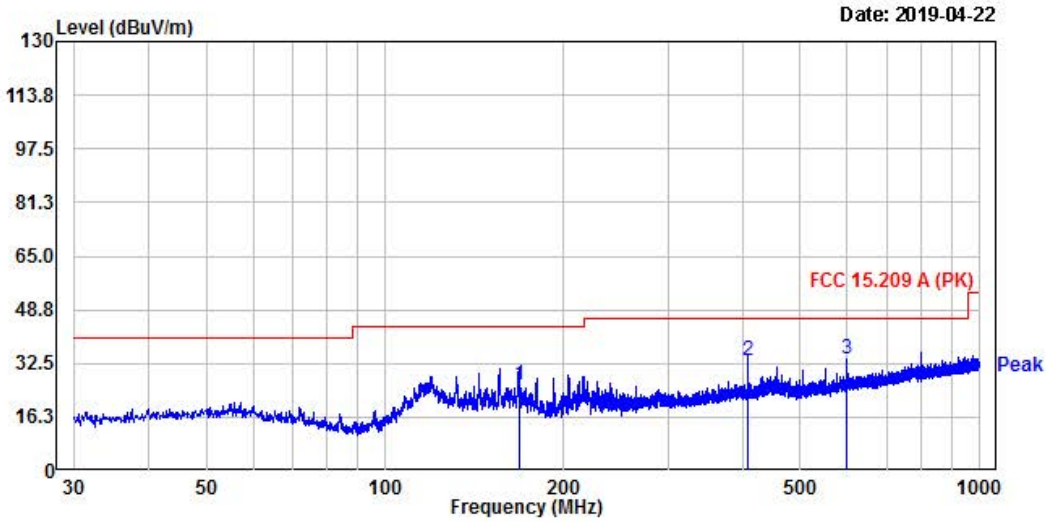
EUT/Model No.: PT400TWR  Temp/Humi: 23 / 36
Test Mode : RFID mode  Tested by: Kwon H C




| Freq | Reading | C.F | Result QP | Limit | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | deg | |
| 167.98 | 38.61 | -12.69 | 25.92 | 43.52 | 17.60 | 100 | 347 | vertical |
| 408.06 | 42.15 | -8.89 | 33.26 | 46.02 | 12.76 | 100 | 360 | vertical |
| 600.00 | 38.49 | -4.81 | 33.68 | 46.02 | 12.34 | 100 | 0 | vertical |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



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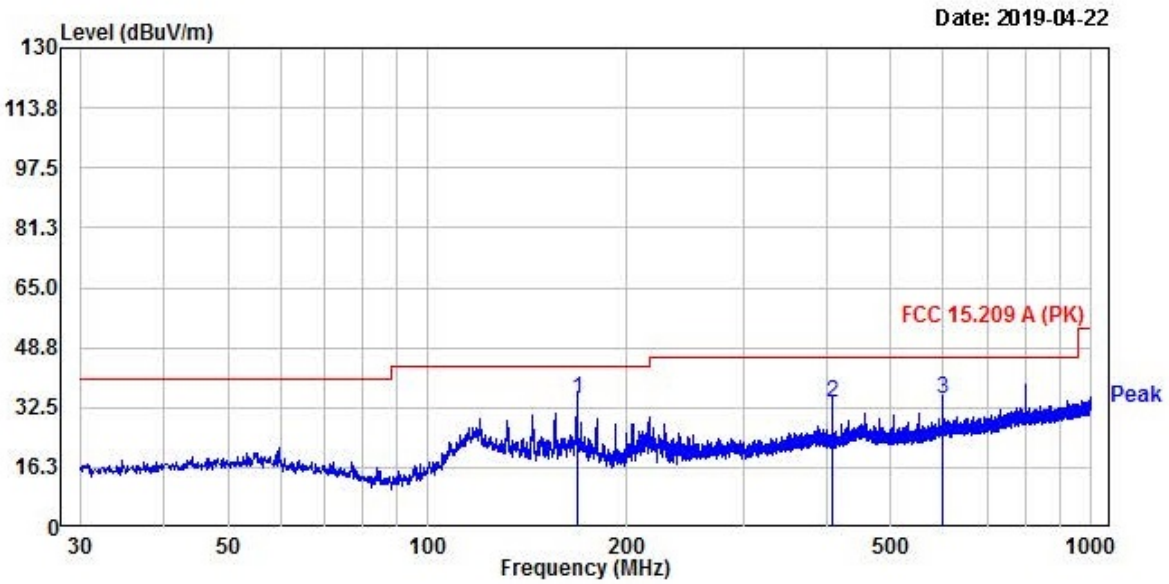
EUT/Model No.: PT400TWR  Temp/Humi: 23 / 36

Test Mode : RFID mode  Tested by: Kwon H C




| Freq | Reading | C.F | Result QP | Limit | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | deg | |
| 167.98 | 47.43 | -12.69 | 34.74 | 43.52 | 8.78 | 0 | 324 | horizontal |
| 408.06 | 42.67 | -8.89 | 33.78 | 46.02 | 12.24 | 0 | 3 | horizontal |
| 600.00 | 39.50 | -4.81 | 34.69 | 46.02 | 11.33 | 0 | 0 | horizontal |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

### 3.3.3 Frequency Tolerance

**Procedure:**

The temperature test was started after the temperature stabilization time of 30 minutes.

**Requirement:**

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test method : ANSI C63.10 : 2013

Tx Frequency : 13.56 MHz

Result : **Complies**

**Measurement Data:**

**OPERATING FREQUENCY:** **13,560,000** **Hz**

**Freq. Tolerance Limit:** **± 0.01** **%**

| VOLTAGE (%) | POWER (Vdc) | TEMP (°C) | @2 mins FREQ (Hz) | Deviation (%) | @5 mins FREQ (Hz) | Deviation (%) | @10 mins FREQ (Hz) | Deviation (%) |
|---|---|---|---|---|---|---|---|---|
| **100** | **6.0** | **-20** | 13,560,031 | 0.00022 | 13,560,032 | 0.00023 | 13,560,032 | 0.00025 |
| **100** | | **-10** | 13,560,034 | 0.00025 | 13,560,036 | 0.00026 | 13,560,037 | 0.00027 |
| **100** | | **0** | 13,560,032 | 0.00023 | 13,560,033 | 0.00024 | 13,560,033 | 0.00024 |
| **100** | | **10** | 13,560,035 | 0.00025 | 13,560,038 | 0.00028 | 13,560,039 | 0.00028 |
| **100** | | **20** | 13,560,037 | 0.00027 | 13,560,038 | 0.00028 | 13,560,038 | 0.00028 |
| **100** | | **30** | 13,560,043 | 0.00031 | 13,560,045 | 0.00033 | 13,560,046 | 0.00033 |
| **100** | | **40** | 13,560,047 | 0.00034 | 13,560,049 | 0.00036 | 13,560,051 | 0.00037 |
| **100** | | **50** | 13,560,047 | 0.00034 | 13,560,048 | 0.00035 | 13,560,049 | 0.00036 |
| **85** | **102** | **20** | 13,560,016 | 0.00011 | 13,560,018 | 0.00013 | 13,560,019 | 0.00014 |
| **115** | **138** | **20** | 13,559,979 | 0.00015 | 13,559,977 | 0.00016 | 13,559,976 | 0.00017 |

# APPENDIX **A**

## TEST EQUIPMENT USED FOR TESTS

| | Use | Description | Model No. | Serial No. | Manufacturer | Interval | Last Cal. Date |
|---|---|---|---|---|---|---|---|
| 1 | ■ | Signal Analyzer (9 kHz ~ 30 GHz) | FSV30 | 100757 | R&S | 1 year | 2018-09-06 |
| 2 | | SYNTHESIZED CW GENERATOR | 83711B | US34490456 | HP | 1 year | 2019-03-16 |
| 3 | | Attenuator (3 dB) | 8491A | 37822 | HP | 1 year | 2018-09-06 |
| 4 | | Attenuator (10 dB) | 8491A | 63196 | HP | 1 year | 2018-09-06 |
| 5 | ■ | EMI Test Receiver (~7 GHz) | ESCI7 | 100722 | R&S | 1 year | 2018-09-06 |
| 6 | ■ | RF Amplifier (~1.3 GHz) | 8447D OPT 010 | 2944A07684 | HP | 1 year | 2018-09-06 |
| 7 | ■ | RF Amplifier (1~26.5 GHz) | 8449B | 3008A02126 | HP | 1 year | 2019-03-16 |
| 8 | | Horn Antenna (1~18 GHz) | 3115 | 00114105 | ETS | 2 year | 2018-08-04 |
| 9 | | DRG Horn (Small) | 3116B | 81109 | ETS-Lindgren | 2 year | 2018-05-03 |
| 10 | | DRG Horn (Small) | 3116B | 133350 | ETS-Lindgren | 2 year | 2018-05-03 |
| 11 | ■ | TRILOG Antenna | VULB 9160 | 9160-3237 | SCHWARZBECK | 2 year | 2019-03-16 |
| 12 | | DC Power Supply | 6674A | 3637A01657 | Agilent | - | - |
| 13 | | Power Meter | EPM-441A | GB32481702 | HP | 1 year | 2019-03-16 |
| 14 | | Power Sensor | 8481A | 3318A94972 | HP | 1 year | 2018-09-06 |
| 15 | | Audio Analyzer | 8903B | 3729A18901 | HP | 1 year | 2018-09-06 |
| 16 | | Modulation Analyzer | 8901B | 3749A05878 | HP | 1 year | 2018-09-06 |
| 17 | | TEMP & HUMIDITY Chamber | YJ-500 | LTAS06041 | JinYoung Tech | 1 year | 2018-09-06 |
| 18 | | Stop Watch | HS-3 | 812Q08R | CASIO | 2 year | 2018-03-21 |
| 19 | ■ | LISN | KNW-407 | 8-1430-1 | Kyoritsu | 1 year | 2018-09-06 |
| 20 | | Two-Lime V-Network | ESH3-Z5 | 893045/017 | R&S | 1 year | 2019-03-16 |
| 21 | | Highpass Filter | WHKX1.5/15G-10SS | 74 | Wainwright Instruments | 1 year | 2019-03-16 |
| 22 | | Highpass Filter | WHKX3.0/18G-10SS | 118 | Wainwright Instruments | 1 year | 2019-03-16 |
| 23 | | OSP120 BASE UNIT | OSP120 | 101230 | R&S | 1 year | 2019-03-16 |
| 24 | ■ | Signal Generator(100 kHz ~ 40 GHz) | SMB100A | 177621 | R&S | 1 year | 2019-03-16 |
| 25 | | Vector Signal Generator(9kHz ~ 6 GHz) | SMBV100A | 255081 | R&S | 1 year | 2019-03-16 |
| 26 | | Signal Analyzer (10 Hz ~ 40 GHz) | FSV40 | 101367 | R&S | 1 year | 2019-03-16 |
| 27 | ■ | RF Cable | SUCOFLEX | - | Huber+suhner | - | - |
| 28 | ■ | Active Loop Antenna | HFH2-Z2 | - | R&S | 2 year | 2019-03-16 |