

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
Variety 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:

The test was supervised by:



JaBeom, Koo / Manager



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,	2020-09-10	VCCI registration
		T-2416,	2020-09-10	
		R-4483(10 m),	2020-10-15	
		G-847	2022-06-13	
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
 Variant 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 maximum radiation, firstly, there have been viewed all orthogonal adjustments of the test samples, secondly the test sample have been rotated at all adjustments around the own axis between 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

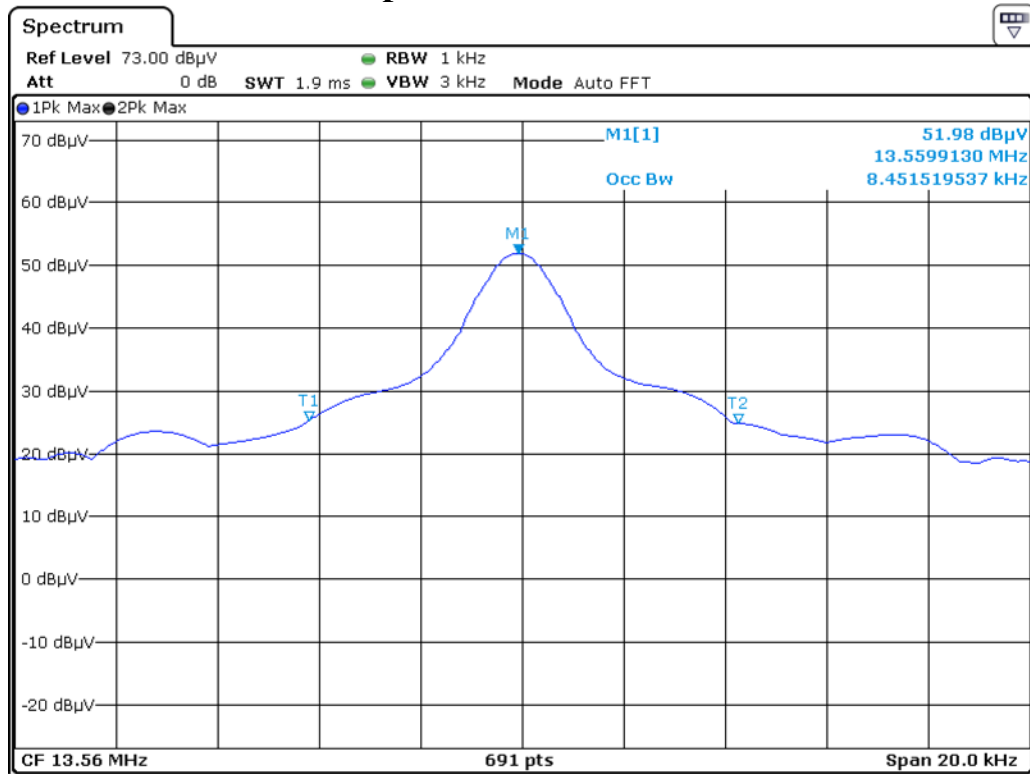
TEST PROCEDURE

Type A with highest 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 field strength from uV/m to dBuV/m is:

$$\text{Limit (dBuV/m)} = 20 \log \text{limit (uV/m)}$$

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

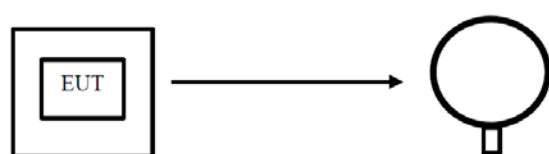
ANSI C63.10, 2013

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**

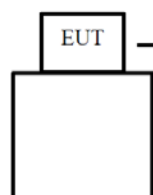
Figure 1. Direction of the Loop Antenna

Horizontal (Top View)

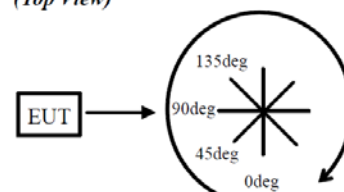


Antenna was not rotated.

Vertical (Side View)



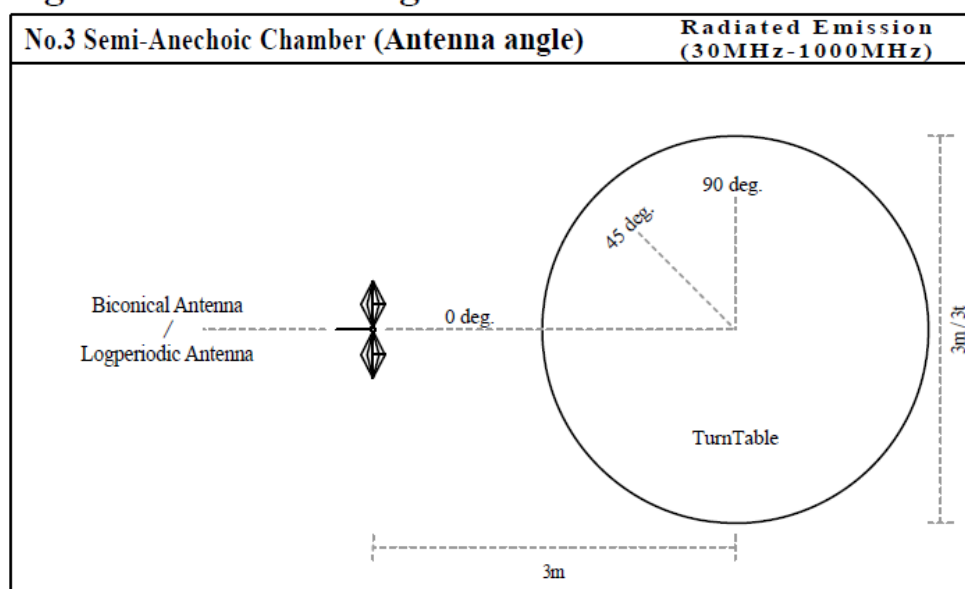
(Top View)



Front side: 0 deg.

Forward direction: clockwise

Figure 2. Antenna angle



- DATA_FUNDAMENTAL



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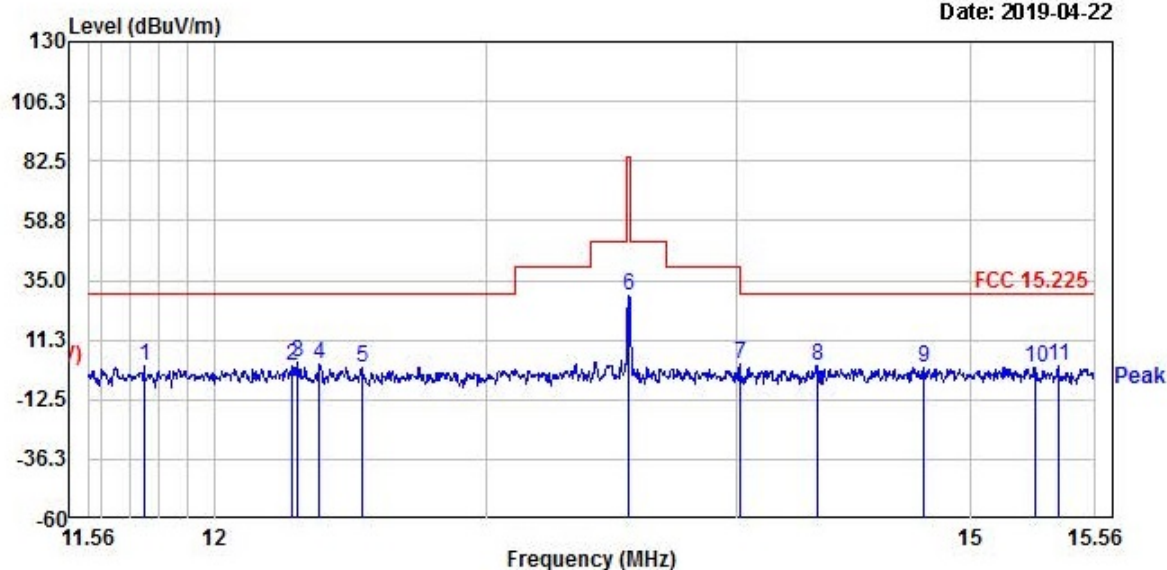
EUT/Model No.: PT400TWR

Temp/Humi: 23 / 36

Test Mode : RFID mode

Tested by: Kwon H C

Date: 2019-04-22



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP 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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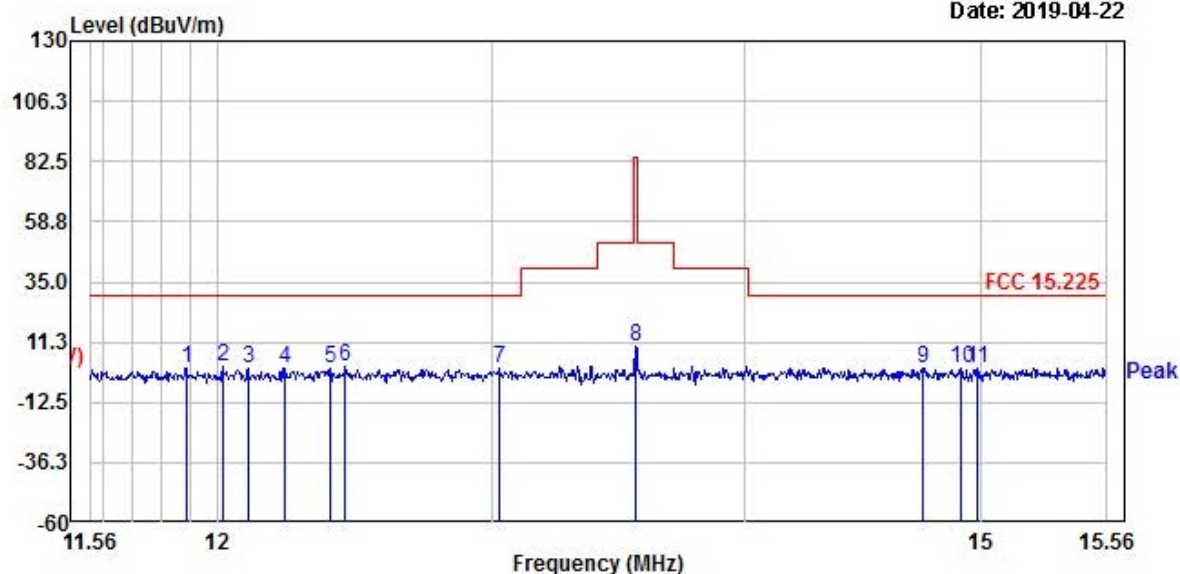
EUT/Model No.: PT400TWR

Temp/Humi: 23 / 36

Test Mode : RFID mode

Tested by: Kwon H C

Date: 2019-04-22



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP 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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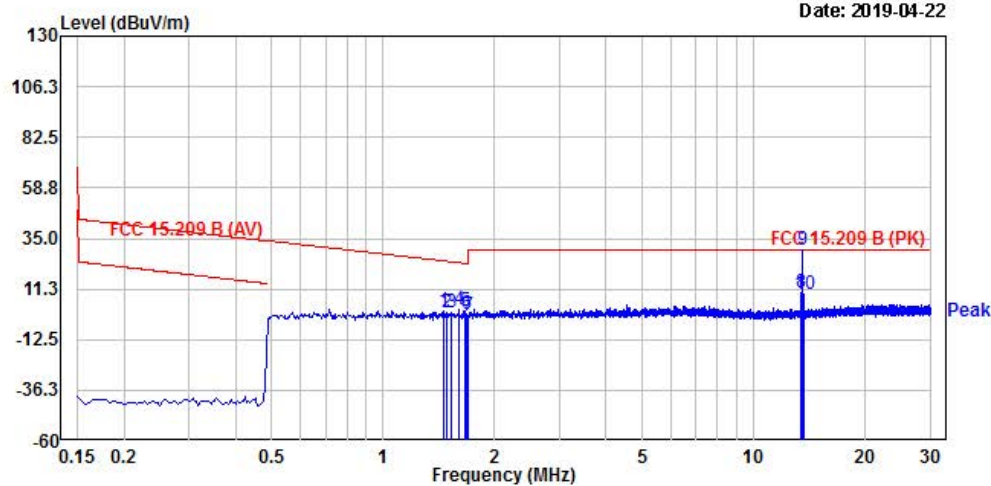
EUT/Model No.: PT400TWR

Temp/Humi: 23 / 36

Test Mode : RFID mode

Tested by: Kwon H C

Date: 2019-04-22



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP 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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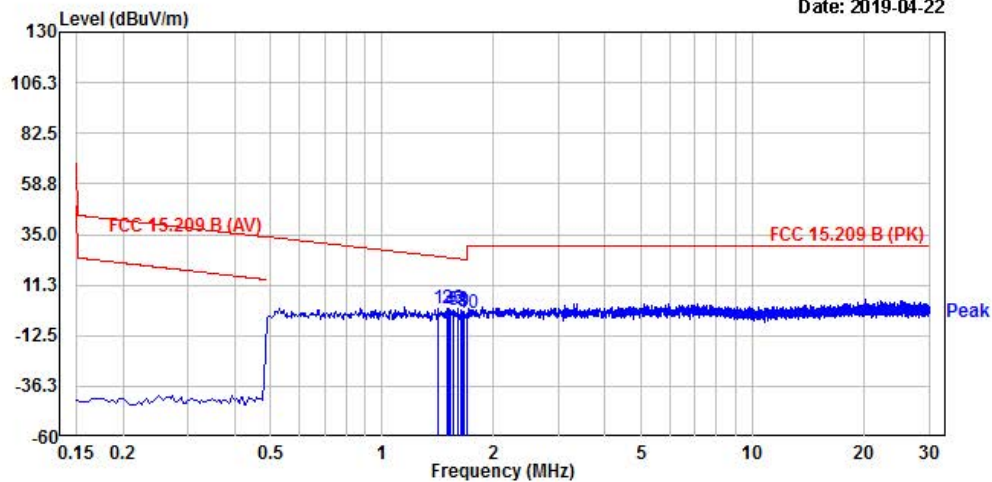
EUT/Model No.: PT400TWR

Temp/Humi: 23 / 36

Test Mode : RFID mode

Tested by: Kwon H C

Date: 2019-04-22



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP 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



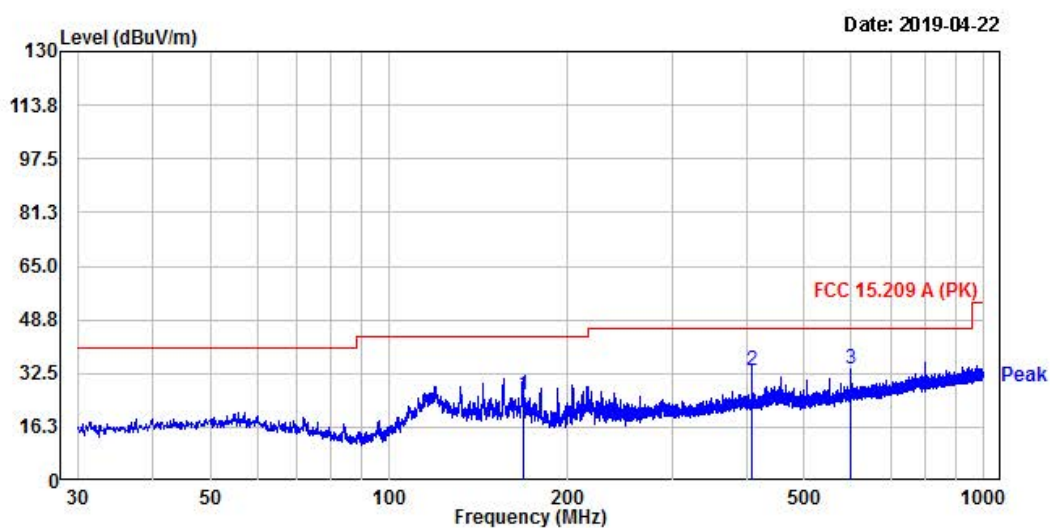
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EUT/Model No.: PT400TWR

Temp/Humi: 23 / 36

Test Mode : RFID mode

Tested by: Kwon H C



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP 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



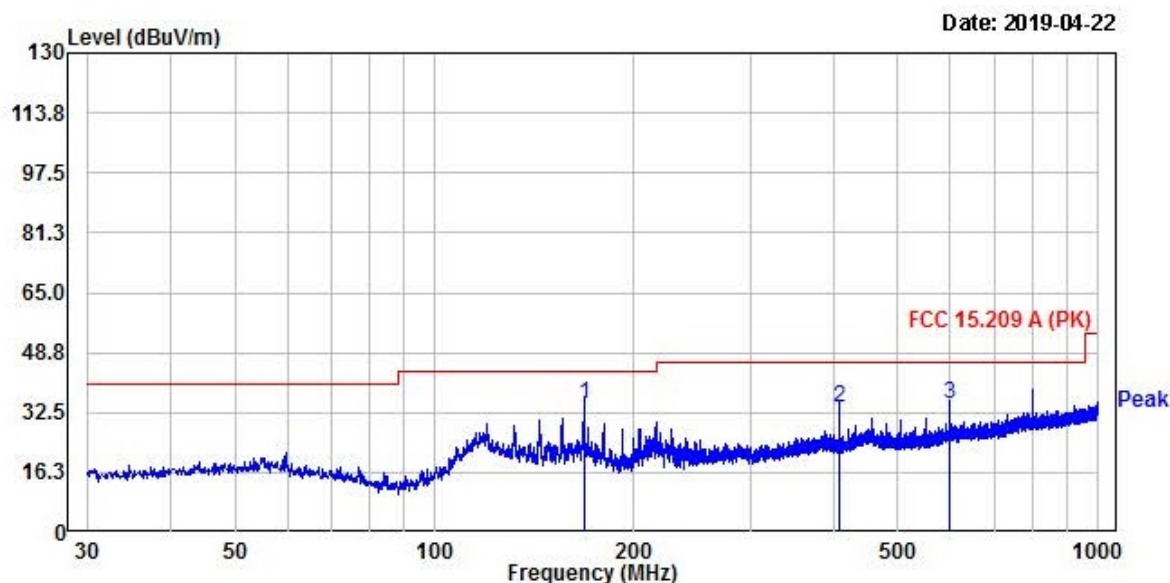
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EUT/Model No.: PT400TWR

Temp/Humi: 23 / 36

Test Mode : RFID mode

Tested by: Kwon H C



Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP 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