

TEST REPORT

FCC NFC Test for FX100

APPLICANT
PASSTECH CO., LTD

REPORT NO.
HCT-RF-2105-FC044-R2

DATE OF ISSUE
May 27, 2021

Tested by
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TEST REPORT

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FCC ID

W6YFX100

Applicant

PASSTECH CO., LTD

B-402. 215 Galmachi-ro, Jungwon-gu, Seongnam-si, Gyeonggi-do, Rep. of Korea (Zip 13217)

**Eut Type
Model Name**

FURNITURE LOCK
FX100

RF Output Field Strength

17.35 dBuV/m @30 m

Frequency of Operation

13.56 MHz

Modulation type

ASK

FCC Classification

Low Power Communication Device Transmitter (DXX)

FCC Rule Part(s)

FCC Part 15.225 Subpart C

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test results were applied only to the test methods required by the standard.



REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	May 26, 2021	Initial Release
1	May 27, 2021	Include the additional dummy load test data
2	May 27, 2021	Added previous powerline conducted data

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance. measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

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1. EUT DESCRIPTION

Model	FX100
Additional model	FX100WR, FX200, FX200WR
EUT Type	FURNITURE LOCK
Manufacturer Name Address	PASSTECH CO., LTD B-402. 215 Galmachi-ro, Jungwon-gu, Seongnam-si, Gyeonggi-do, Rep. of Korea (Zip 13217)
Factory Name Address	PASSTECH CO., LTD B-402. 215 Galmachi-ro, Jungwon-gu, Seongnam-si, Gyeonggi-do, Rep. of Korea (Zip 13217)
Power Supply	FX100(DC) 3.0 V FX200(AC Adaptor) 100 ~ 220 V, Output DC 5V
Frequency Range	13.56 MHz
Transmit Power	17.35 dBuV/m @30 m
Modulation Type	ASK
Antenna type	Antenna type: PCB Pattern Antenna
Date(s) of Tests	May 14, 2021~ May 25, 2021

2. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) is used in the measurement of the test device.

EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.225 under the FCC Rules Part 15 Subpart C.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013).

DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

(1) The antennas of this E.U.T are permanently attached.

(2) The E.U.T Complies with the requirement of § 15.203

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicate a 95 % level of confidence.

The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05

7. DESCRIPTION OF TESTS

7.1. Radiated Test

Limit (Operation within the band 13.110 MHz – 14.010 MHz)

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
13.553 – 13.567	15,848	30
13.410 ≤ f ≤ 13.553 13.567 ≤ f ≤ 13.710	334	30
13.110 ≤ f ≤ 13.410 13.710 ≤ f ≤ 14.010	106	30

Note:

1. 15,848 uV/m = 84.0 dBuV/m
2. 334 uV/m = 50.47 dBuV/m
3. 106 uV/m = 40.51 dBuV/m

Limit (Radiated Spurious Emissions)

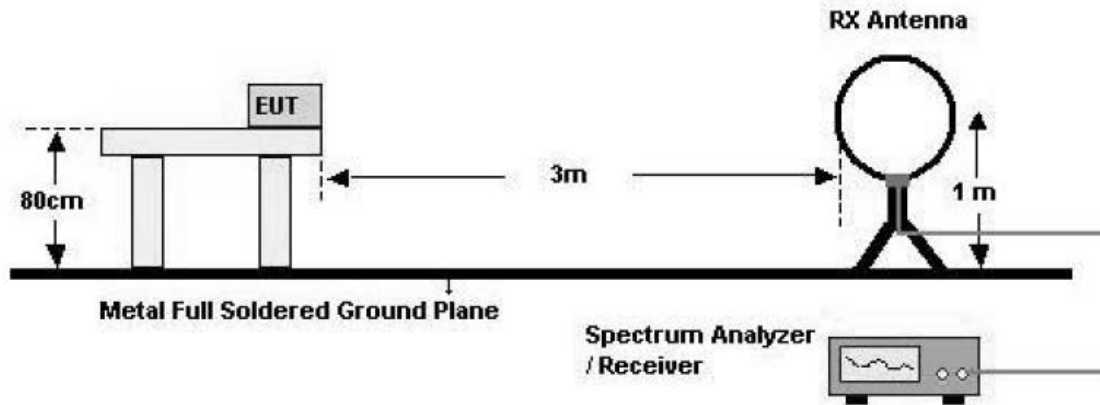
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	*100	3
88-216	*150	3
216-960	*200	3
Above 960	500	3

※:

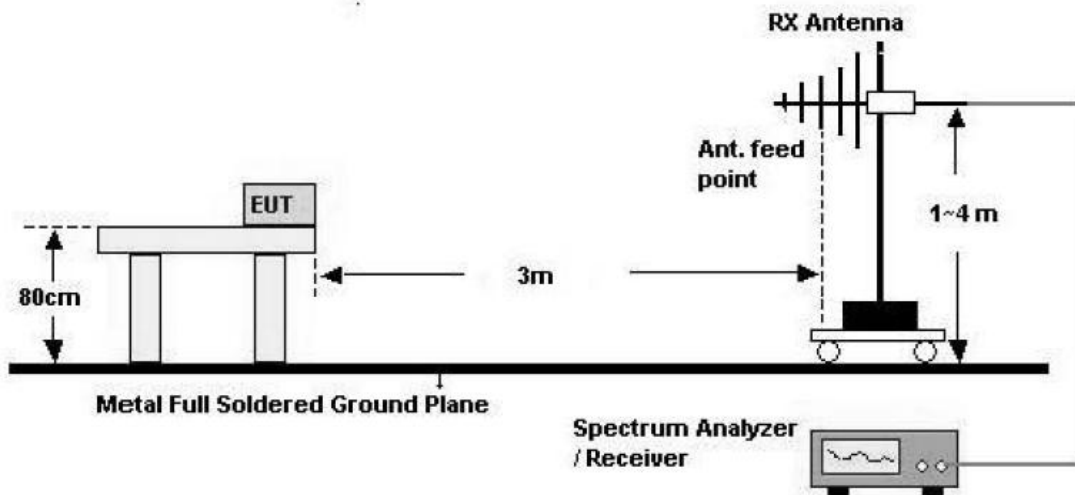
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

Test Configuration

Below 30 MHz



30 MHz - 1 GHz



Test Procedure of inband

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Distance Correction Factor = $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$

Measurement Distance : 3 m (Below 30 MHz)

7. Spectrum Setting

- Detector = Peak
- Trace = Maxhold
- RBW = 9 kHz
- VBW $\geq 3 \times$ RBW

8. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.

2. The loop antenna was placed at a location 3m from the EUT

3. The EUT is placed on a turntable, which is 0.8m above ground plane.

4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = $40\log(3\text{ m}/300\text{ m}) = -80\text{ dB}$

Measurement Distance : 3 m

7. Distance Correction Factor(0.490 MHz – 30 MHz) = $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$

Measurement Distance : 3 m

8. Spectrum Setting

- Frequency Range = 9 kHz ~ 30 MHz
- Detector = Peak
- Trace = Maxhold
- RBW = 9 kHz
- VBW $\geq 3 \times$ RBW

9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

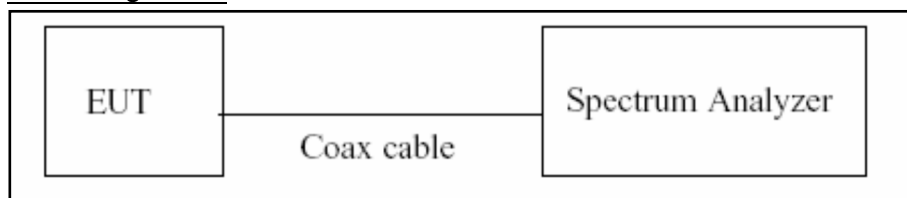
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

Test Procedure of Radiated spurious emissions(Above 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
 - Frequency Range = 30 MHz ~ 1 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 100 kHz
 - VBW $\geq 3 \times$ RBW
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

7.2. 20dB Bandwidth

Test Configuration



Test Procedure

The 20 dB bandwidth was measured by using a spectrum analyzer.

(Procedure 6.9.2 in ANSI 63.10-2013)

- 1) RBW = 1%~5% of the OBW
- 2) VBW = approximately three times RBW
- 3) Span = between two times and five times the OBW
- 4) Detector = Peak
- 5) Trace mode = Max hold
- 6) Allow the trace to stabilize

Note :

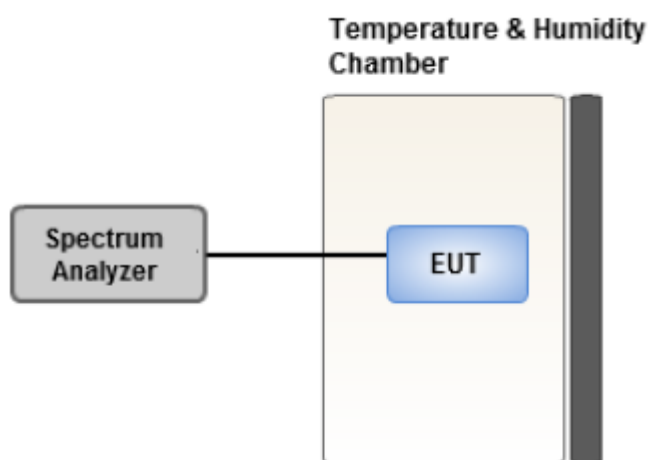
We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

7.3. Frequency Stability

Limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

Test Configuration



Test Procedure.

For battery operated equipment, the equipment tests shall be performed using a new battery.

- 1) Turn the EUT OFF and place it inside the environmental temperature chamber.
For devices that have oscillator heaters, energize only the heater circuit.
- 2) Set the temperature control on the chamber to the highest specified in the regulatory requirements
for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
- 3) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.
- 4) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

Note:

- 1) Temperature:
The temperature is varied from -20°C to $+50^{\circ}\text{C}$ using an environmental chamber.
- 2) Primary Supply Voltage :
The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried



battery and AC powered equipment.

For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

7.4. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.
5. The EUT is the device operating below 30 MHz.
 - For unterminated the Antenna, the AC line conducted tests are performed with the antenna connected
 - For terminated the Antenna, the AC line conducted tests are performed with a dummy load connected to the EUT antenna output terminal.

Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

7.5. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode :
 - Worstcase : Stand alone
2. EUT Axis : Y
3. All type and bitrate were investigated and the worst case results are reported.
 - Worst case : Type A, 106 kbps
4. All mode of without tag and with tag were investigated and the worst case configuration results are reported.
 - Worstcase : Without Tag
5. All position of loop antenna were investigated and the worst case configuration results are reported.
 - Position : Horizontal, Vertical, Parallel to the ground plane
 - Worstcase : Horizontal
6. FX100, FX200 were tested and the worst case results are reported.
 - Worst case : FX100(DC)

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
2. FX200 were tested and the worst case results are reported.
 - Worst case : FX200(AC)

20dB Bandwidth & Frequency Stability

1. All type and bitrate were investigated and the worst case results are reported.
 - Worst case : Type A, 106 kbps
2. FX100, FX200 were tested and the worst case results are reported.
 - Worst case : FX100

8. TEST SUMMARY

Regulation	Requirement	Result
Part 15.225 (a)	Radiated Electric Field Emissions (13.553MHz to 13.567MHz)	Pass
Part 15.225 (b)	Radiated Electric Field Emissions ($13.410 \leq f \leq 13.553$, $13.567 \leq f \leq 13.710$)	Pass
Part 15.225 (c)	Radiated Electric Field Emissions ($13.110 \leq f \leq 13.410$, $13.710 \leq f \leq 14.010$)	Pass
Part 15.209	Radiated Electric Field Emissions (9kHz to 30MHz)	Pass
Part 15.209	Radiated Electric Field Emissions (30MHz to 1GHz)	Pass
Part 15.225 (e)	Frequency Stability	Pass
Part 15.207	AC power conducted emissions (150kHz to 30MHz)	Pass
Part 15.215 (c)	20 dB Bandwidth	Pass

9. TEST RESULT

9.1. Operation within the band 13.110 MHz – 14.010 MHz

- FX100(DC)

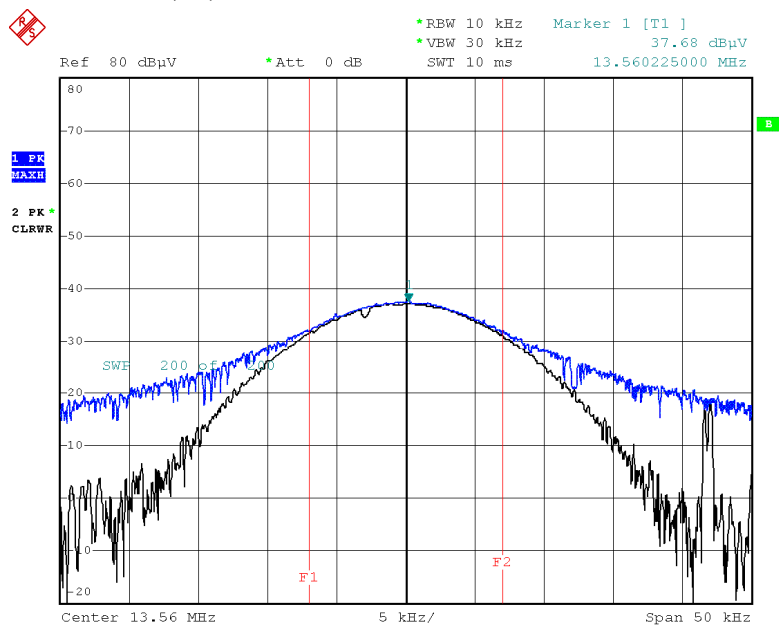
Measured Frequency Range : 13.553 MHz-13.567 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5604	37.68	19.67	-40.00	Y-H	17.35	84.00	66.65
13.5593	34.85	19.67	-40.00	Y-H	14.52	84.00	69.48

Measured Frequency Range : 13.410 MHz-13.553 MHz and 13.567 MHz-13.710 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5530	31.98	19.67	-40.00	Y-H	11.65	50.47	38.82
13.5670	31.44	19.67	-40.00	Y-H	11.11	50.47	39.36

Measured Frequency Range : 13.110 MHz – 13.410 MHz and 13.710 MHz-14.010 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5530	16.94	19.67	-40.00	Y-H	-3.39	40.51	43.90
13.7691	16.44	19.67	-40.00	Y-H	-3.89	40.51	44.40

Test Plot

13.553 MHz ~ 13.567 MHz_FX100(DC)



Date: 25.MAY.2021 10:57:52

Note:

Plot of worst case are only reported.



- FX200(AC)

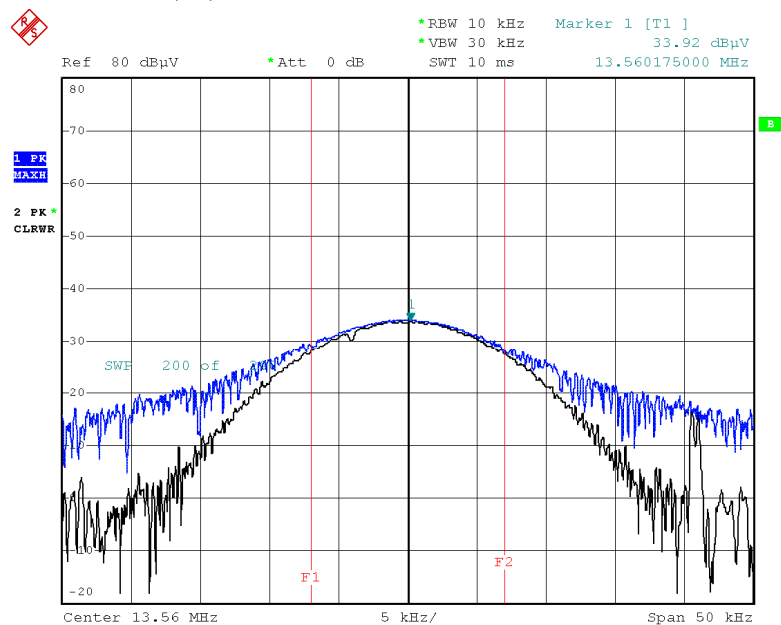
Measured Frequency Range :

13.553 MHz-13.567 MHz

Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
13.5602	33.92	19.67	-40.00	Z-H	13.59	84.00	70.41
13.5584	29.15	19.67	-40.00	Z-V	8.82	84.00	75.18

Test Plot

13.553 MHz ~ 13.567 MHz_FX200(AC)



Date: 25.MAY.2021 18:15:38

Note:

Plot of worst case are only reported.



9.2. Radiated Emission 9 kHz – 30 MHz

- FX100(DC)

Measured Frequency Range :							
9 kHz - 30 MHz							
Frequency (MHz)	Read Level (dBuV/m)@3m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBuV/m)@30m	Limit (dBuV/m)@30m	Margin (dB)
7.5580	18.39	19.53	-40.00	2nd-H	-2.08	29.54	31.62
20.1975	20.53	20.24	-40.00	2nd-H	0.77	29.54	28.77
27.3534	19.27	20.19	-40.00	2nd-H	-0.54	29.54	30.08
27.4862	19.21	20.19	-40.00	2nd-V	-0.60	29.54	30.14

9.3. Radiated Emission 30 MHz – 1000 MHz

- FX100(DC)

Measured Frequency Range :

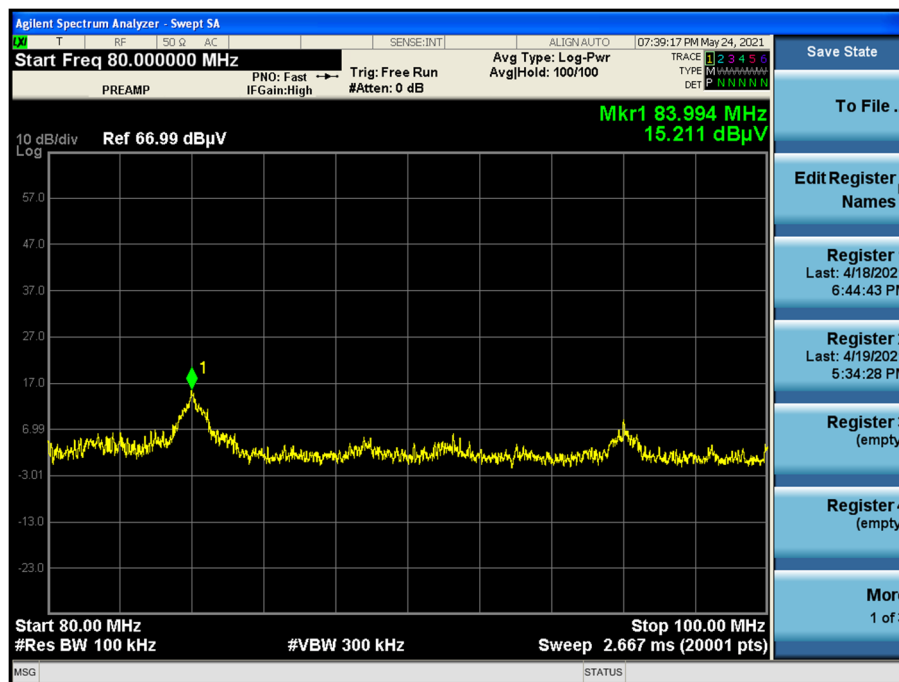
30 MHz - 1000 MHz

Frequency (MHz)	Read Level (dBuV/m) @3m	Ant.Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)
#37.8875	3.944	18.40	0.51	V	22.85	40.00	17.15
60.0180	4.116	18.80	0.72	V	23.64	40.00	16.37
#74.3280	3.218	16.90	0.77	V	20.89	40.00	19.11
83.9940	15.211	14.10	0.84	H	30.15	40.00	9.85
#120.0075	12.271	16.90	1.00	H	30.18	43.50	13.33
180.2860	7.522	17.20	1.23	V	25.96	43.50	17.55

Note:

1. “#” is the result for restricted band.

Test Plot



Note:

Plot of worst case are only reported

- FX200(AC)

Measured Frequency Range :

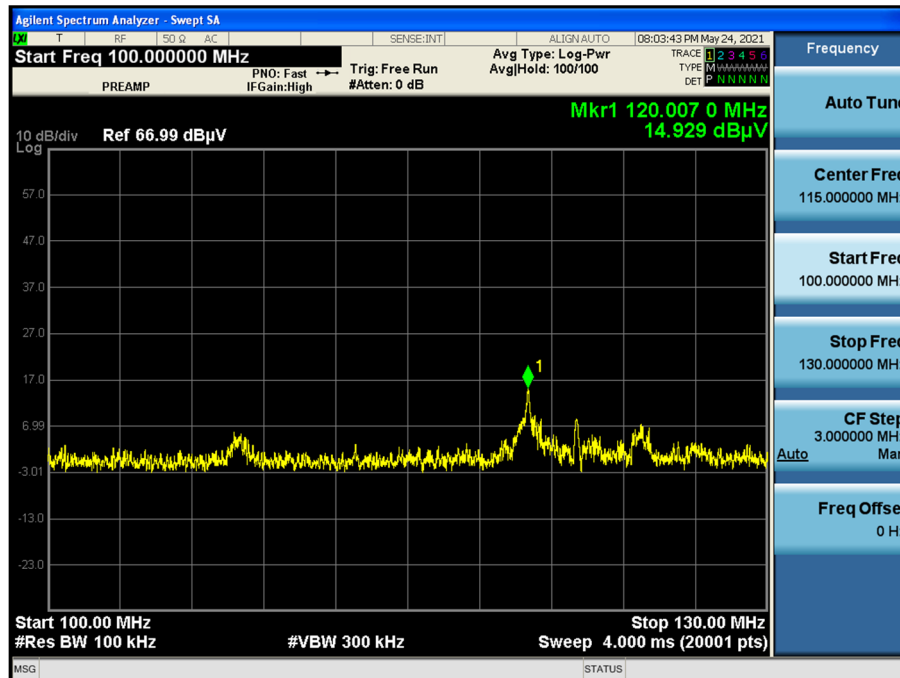
30 MHz - 1000 MHz

Frequency (MHz)	Read Level (dBuV/m) @3m	Ant.Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)
#38.1416	4.220	18.40	0.51	V	23.13	40.00	16.87
72.0720	7.381	16.90	0.77	V	25.05	40.00	14.95
#75.0669	4.360	16.90	0.77	V	22.03	40.00	17.97
#120.0070	14.929	16.90	1.00	H	32.83	43.50	10.67
#168.3305	8.173	18.00	1.20	H	27.37	43.50	16.13
192.2930	13.036	17.20	1.23	V	31.47	43.50	12.03

Note:

1. “#” is the result for restricted band.

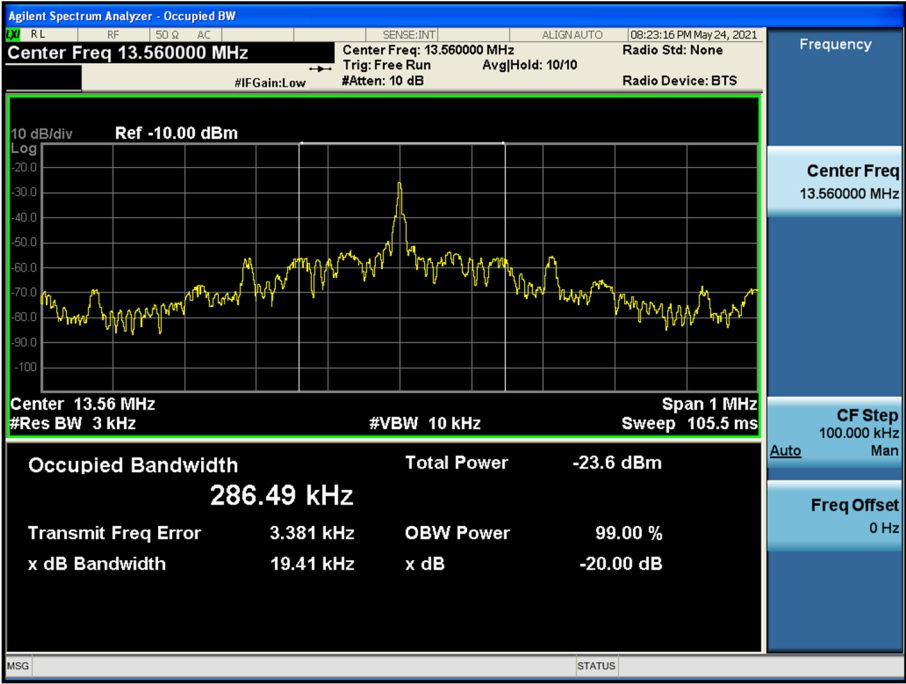
☐ Test Plot



Note:

Plot of worst case are only reported

9.4. 20 dB Bandwidth



9.5. Frequency Stability

- FX100(DC)

Startup

PERATING FREQUENCY:	13.56 MHz
REFERENCE VOLTAGE:	3.00 VDC
DEVIATION LIMIT:	$\pm 0.01 \% = \pm 1356 \text{ Hz}$

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	3	-20	13.560881	881	0.0064999
100%		-10	13.560857	857	0.0063178
100%		0	13.560962	962	0.0070927
100%		+10	13.560803	803	0.0059220
100%		+20(Ref.)	13.561034	1034	0.0076247
100%		+30	13.560976	976	0.0071958
100%		+40	13.560971	971	0.0071633
100%		+50	13.561043	1043	0.0076903
LOW	2.55	+20	13.561073	1073	0.0079120
HIGH	3.45	+20	13.560997	997	0.0073504



2 minutes

PERATING FREQUENCY: 13.56 MHz
 REFERENCE VOLTAGE: 3.00 VDC
 DEVIATION LIMIT: $\pm 0.01\% = \pm 1356\text{ Hz}$

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	3	-20	13.561108	1108	0.0081699
100%		-10	13.560829	829	0.0061131
100%		0	13.561093	1093	0.0080627
100%		+10	13.561099	1099	0.0081041
100%		+20(Ref.)	13.560794	794	0.0058590
100%		+30	13.560749	749	0.0055265
100%		+40	13.560832	832	0.0061341
100%		+50	13.560847	847	0.0062438
LOW	2.55	+20	13.561014	1014	0.0074768
HIGH	3.45	+20	13.560723	723	0.0053353



5 minutes

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 3.00 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	3	-20	13.561070	1070	0.0078935
100%		-10	13.561076	1076	0.0079384
100%		0	13.560826	826	0.0060914
100%		+10	13.560865	865	0.0063816
100%		+20(Ref.)	13.560889	889	0.0065575
100%		+30	13.560921	921	0.0067905
100%		+40	13.561069	1069	0.0078802
100%		+50	13.560853	853	0.0062872
LOW	2.55	+20	13.561108	1108	0.0081717
HIGH	3.45	+20	13.561044	1044	0.0077020



10 minutes

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 3.00 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	3	-20	13.560946	946	0.0069756
100%		-10	13.560860	860	0.0063448
100%		0	13.560971	971	0.0071628
100%		+10	13.561018	1018	0.0075077
100%		+20(Ref.)	13.560977	977	0.0072050
100%		+30	13.560754	754	0.0055616
100%		+40	13.560819	819	0.0060424
100%		+50	13.560811	811	0.0059810
LOW	2.55	+20	13.560713	713	0.0052599
HIGH	3.45	+20	13.560714	714	0.0052662

- FX200(AC)

Startup

PERATING FREQUENCY: 13.56 MHz
REFERENCE VOLTAGE: 110 VAC
DEVIATION LIMIT: $\pm 0.01 \% = \pm 1356 \text{ Hz}$

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VAC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	110	-20	13.560726	726	0.0053546
100%		-10	13.560797	797	0.0058758
100%		0	13.560982	982	0.0072426
100%		+10	13.560758	758	0.0055879
100%		+20(Ref.)	13.560822	822	0.0060588
100%		+30	13.561023	1023	0.0075435
100%		+40	13.560711	711	0.0052444
100%		+50	13.560862	862	0.0063586
LOW	93.5	+20	13.561007	1007	0.0074293
HIGH	126.5	+20	13.560950	950	0.0070045



2 minutes

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 110 VAC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VAC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	110	-20	13.560971	971	0.0071603
100%		-10	13.560805	805	0.0059341
100%		0	13.560917	917	0.0067648
100%		+10	13.560920	920	0.0067833
100%		+20(Ref.)	13.560809	809	0.0059690
100%		+30	13.560939	939	0.0069240
100%		+40	13.560938	938	0.0069199
100%		+50	13.560806	806	0.0059421
LOW	93.5	+20	13.560781	781	0.0057599
HIGH	126.5	+20	13.561065	1065	0.0078557



5 minutes

PERATING FREQUENCY: 13.56 MHz
 REFERENCE VOLTAGE: 110 VAC
 DEVIATION LIMIT: $\pm 0.01 \% = \pm 1356 \text{ Hz}$

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VAC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	110	-20	13.560763	763	0.0056276
100%		-10	13.560720	720	0.0053080
100%		0	13.560724	724	0.0053407
100%		+10	13.560817	817	0.0060219
100%		+20(Ref.)	13.561064	1064	0.0078475
100%		+30	13.560966	966	0.0071213
100%		+40	13.560732	732	0.0054004
100%		+50	13.560862	862	0.0063581
LOW	93.5	+20	13.560776	776	0.0057200
HIGH	126.5	+20	13.560987	987	0.0072799



10 minutes

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 110 VAC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VAC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	110	-20	13.560811	811	0.0059827
100%		-10	13.561023	1023	0.0075446
100%		0	13.560739	739	0.0054518
100%		+10	13.561011	1011	0.0074560
100%		+20(Ref.)	13.560985	985	0.0072642
100%		+30	13.560723	723	0.0053338
100%		+40	13.560768	768	0.0056659
100%		+50	13.560968	968	0.0071369
LOW	93.5	+20	13.561013	1013	0.0074675
HIGH	126.5	+20	13.560867	867	0.0063942

9.6. POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)_ FX200(AC)

Note : 13.56MHz is Fundamental Signal.

Test

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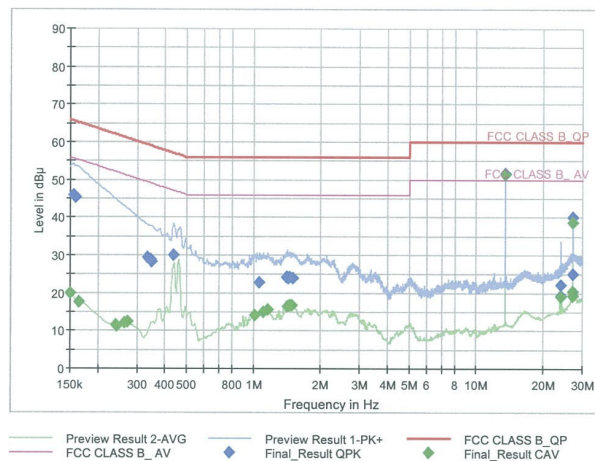
Test Report

Common Information

EUT :
Manufacturer :
Test Site:
Operating Conditions :
Operator Name:
Comment:

FX200
PASSTECH CO., LTD
SHIELD ROOM
RFID_L1

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak	Limit (dBuV)	Margin	Bandwidth	Line	Filter	Corr. (dB)
0.1545	45.95	65.75	19.80	9.000	L1	OFF	9.6
0.1590	45.42	65.52	20.09	9.000	L1	OFF	9.6
0.3345	29.37	59.34	29.97	9.000	L1	OFF	9.6
0.3435	28.84	59.12	30.27	9.000	L1	OFF	9.6
0.3503	28.35	58.96	30.61	9.000	L1	OFF	9.6
0.4380	28.87	57.10	27.23	9.000	L1	OFF	9.6
1.0670	22.84	56.00	33.16	9.000	L1	OFF	9.6
1.4090	24.24	56.00	31.76	9.000	L1	OFF	9.6
1.4248	24.25	56.00	31.75	9.000	L1	OFF	9.6
1.4405	24.08	56.00	31.92	9.000	L1	OFF	9.6
1.4585	24.12	56.00	31.88	9.000	L1	OFF	9.6
1.5080	23.96	56.00	32.04	9.000	L1	OFF	9.6
13.5590	51.75	60.00	8.25	9.000	L1	OFF	9.9
24.0193	22.35	60.00	37.65	9.000	L1	OFF	10.0
24.0350	19.28	60.00	40.72	9.000	L1	OFF	10.0
24.0418	19.37	60.00	40.63	9.000	L1	OFF	10.0
27.1198	40.07	60.00	19.93	9.000	L1	OFF	10.0
27.1513	25.23	60.00	34.77	9.000	L1	OFF	10.0

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오후 1:50:38



Test

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Final Result_CAV

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	19.88	56.00	36.12	9.000	L1	OFF	9.6
0.1635	17.62	55.28	37.66	9.000	L1	OFF	9.6
0.2400	11.47	52.10	40.63	9.000	L1	OFF	9.6
0.2445	11.36	51.94	40.58	9.000	L1	OFF	9.6
0.2625	12.02	51.35	39.33	9.000	L1	OFF	9.6
0.2715	12.50	51.07	38.57	9.000	L1	OFF	9.6
1.0175	14.14	46.00	31.86	9.000	L1	OFF	9.6
1.1120	15.02	46.00	30.98	9.000	L1	OFF	9.6
1.1593	15.72	46.00	30.28	9.000	L1	OFF	9.6
1.4248	16.52	46.00	29.48	9.000	L1	OFF	9.6
1.4518	16.68	46.00	29.32	9.000	L1	OFF	9.6
1.4878	16.60	46.00	29.40	9.000	L1	OFF	9.6
13.5590	51.22	50.00	-1.22	9.000	L1	OFF	9.9
24.0170	19.05	50.00	30.95	9.000	L1	OFF	10.0
24.0553	18.95	50.00	31.05	9.000	L1	OFF	10.0
27.1198	38.67	50.00	11.33	9.000	L1	OFF	10.0
27.1535	20.46	50.00	29.54	9.000	L1	OFF	10.0
27.1873	19.25	50.00	30.75	9.000	L1	OFF	10.0

2021-05-19

오후 1:50:38



Conducted Emissions (Line 2)_ FX200(AC)

Note : 13.56MHz is Fundamental Signal.

Test

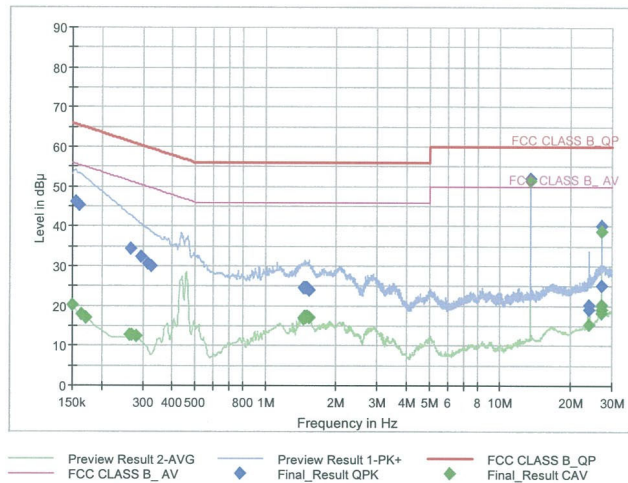
1 / 2

Test Report

Common Information

EUT : FX200
 Manufacturer : PASSTECH CO., LTD
 Test Site: SHIELD ROOM
 Operating Conditions : RFID_N
 Operator Name:
 Comment:

Full Spectrum



Final Result_QPK

Frequency (MHz)	QuasiPeak	Limit (dBuV)	Margin	Bandwidth	Line	Filter	Corr. (dB)
0.1545	46.06	65.75	19.69	9.000	N	OFF	9.6
0.1613	45.31	65.40	20.09	9.000	N	OFF	9.6
0.2670	34.23	61.21	26.98	9.000	N	OFF	9.6
0.2940	32.32	60.41	28.09	9.000	N	OFF	9.6
0.3165	30.67	59.80	29.13	9.000	N	OFF	9.6
0.3278	29.96	59.51	29.55	9.000	N	OFF	9.6
1.4585	24.41	56.00	31.59	9.000	N	OFF	9.6
1.4788	24.65	56.00	31.35	9.000	N	OFF	9.6
1.4878	24.45	56.00	31.55	9.000	N	OFF	9.6
1.4990	24.47	56.00	31.53	9.000	N	OFF	9.6
1.5170	24.22	56.00	31.78	9.000	N	OFF	9.6
1.5395	23.92	56.00	32.08	9.000	N	OFF	9.6
13.5590	52.03	60.00	7.97	9.000	N	OFF	9.8
23.9900	19.18	60.00	40.82	9.000	N	OFF	10.0
24.0058	18.95	60.00	41.05	9.000	N	OFF	10.0
24.0125	20.15	60.00	39.85	9.000	N	OFF	10.0
27.1198	40.05	60.00	19.95	9.000	N	OFF	10.0
27.1535	25.12	60.00	34.88	9.000	N	OFF	10.0

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오후 1:43:16



Test

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Final Result_CAV

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	20.32	56.00	35.68	9.000	N	OFF	9.6
0.1635	17.93	55.28	37.35	9.000	N	OFF	9.6
0.1725	17.15	54.84	37.69	9.000	N	OFF	9.6
0.2625	12.68	51.35	38.67	9.000	N	OFF	9.6
0.2693	12.70	51.14	38.44	9.000	N	OFF	9.6
0.2828	12.37	50.74	38.36	9.000	N	OFF	9.6
1.4495	17.08	46.00	28.92	9.000	N	OFF	9.6
1.4585	16.69	46.00	29.31	9.000	N	OFF	9.6
1.4765	17.30	46.00	28.70	9.000	N	OFF	9.6
1.4855	17.03	46.00	28.97	9.000	N	OFF	9.6
1.5035	17.40	46.00	28.60	9.000	N	OFF	9.6
1.5373	17.02	46.00	28.98	9.000	N	OFF	9.6
13.5590	51.49	50.00	-1.49	9.000	N	OFF	9.8
23.9855	15.16	50.00	34.84	9.000	N	OFF	10.0
26.9600	18.11	50.00	31.89	9.000	N	OFF	10.0
27.0860	19.06	50.00	30.94	9.000	N	OFF	10.0
27.1198	38.64	50.00	11.36	9.000	N	OFF	10.0
27.1535	20.15	50.00	29.85	9.000	N	OFF	10.0

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오후 1:43:16

Conducted Emissions (Line 1)_ FX200(AC)

Test

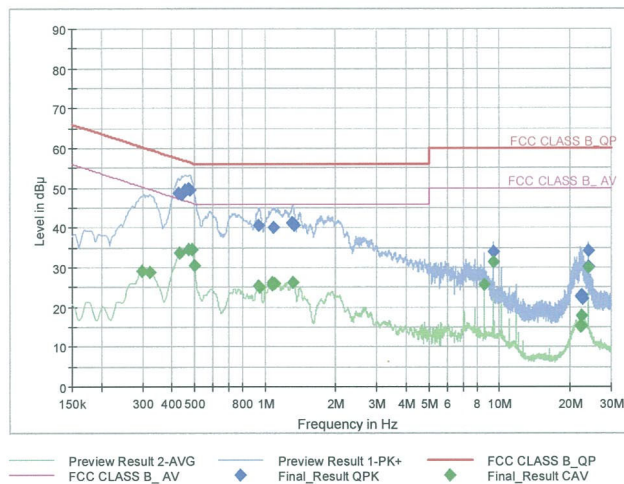
1 / 2

Test Report

Common Information

EUT : FX200
 Manufacturer : PASSTECH CO., LTD
 Test Site: SHIELD ROOM
 Operating Conditions : RFID_L1
 Operator Name:
 Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak	Limit (dBμV)	Margin	Bandwidth	Line	Filter	Corr. (dB)
0.4268	48.67	57.32	8.64	9.000	L1	OFF	9.6
0.4425	48.45	57.02	8.56	9.000	L1	OFF	9.6
0.4515	49.09	56.85	7.75	9.000	L1	OFF	9.6
0.4583	49.58	56.72	7.14	9.000	L1	OFF	9.6
0.4718	49.81	56.48	6.67	9.000	L1	OFF	9.6
0.4785	49.53	56.37	6.83	9.000	L1	OFF	9.6
0.9433	40.65	56.00	15.35	9.000	L1	OFF	9.7
1.0850	40.20	56.00	15.80	9.000	L1	OFF	9.7
1.3055	41.25	56.00	14.75	9.000	L1	OFF	9.7
1.3100	41.37	56.00	14.63	9.000	L1	OFF	9.7
1.3168	41.20	56.00	14.80	9.000	L1	OFF	9.7
1.3258	40.65	56.00	15.35	9.000	L1	OFF	9.7
9.4235	34.01	60.00	25.99	9.000	L1	OFF	10.0
22.2418	22.85	60.00	37.15	9.000	L1	OFF	10.5
22.3700	22.94	60.00	37.06	9.000	L1	OFF	10.5
22.5523	22.08	60.00	37.92	9.000	L1	OFF	10.5
24.0013	34.44	60.00	25.56	9.000	L1	OFF	10.5
24.0058	30.15	60.00	29.85	9.000	L1	OFF	10.5

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오전 10:00:08



Test

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Final Result CAV

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.2985	29.04	50.28	21.25	9.000	L1	OFF	9.6
0.3233	28.92	49.62	20.70	9.000	L1	OFF	9.6
0.4313	33.88	47.23	13.35	9.000	L1	OFF	9.6
0.4740	34.53	46.44	11.91	9.000	L1	OFF	9.6
0.4875	34.60	46.21	11.61	9.000	L1	OFF	9.6
0.5000	30.60	46.00	15.40	9.000	L1	OFF	9.6
0.9388	25.39	46.00	20.61	9.000	L1	OFF	9.7
0.9455	25.14	46.00	20.86	9.000	L1	OFF	9.7
1.0715	25.65	46.00	20.35	9.000	L1	OFF	9.7
1.0783	26.28	46.00	19.72	9.000	L1	OFF	9.7
1.0963	25.91	46.00	20.09	9.000	L1	OFF	9.7
1.3213	26.34	46.00	19.66	9.000	L1	OFF	9.7
8.6383	25.72	50.00	24.28	9.000	L1	OFF	10.0
9.4235	31.44	50.00	18.56	9.000	L1	OFF	10.0
22.2418	15.25	50.00	34.75	9.000	L1	OFF	10.5
22.3115	15.43	50.00	34.57	9.000	L1	OFF	10.5
22.4195	18.02	50.00	31.98	9.000	L1	OFF	10.5
24.0013	30.01	50.00	19.99	9.000	L1	OFF	10.5

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오전 10:00:08

Conducted Emissions (Line 2)_ FX200(AC)

Test

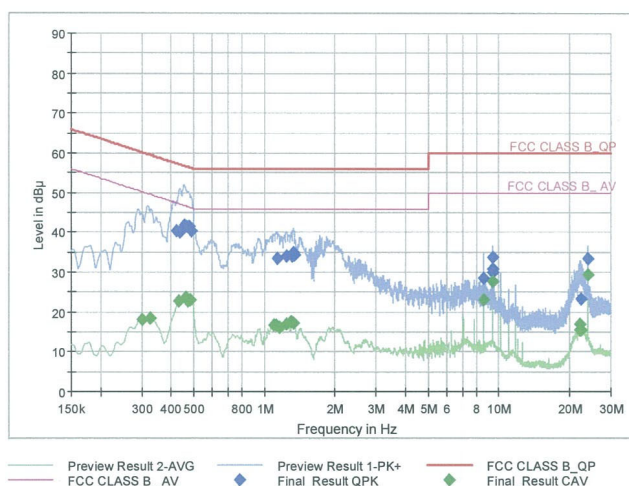
1 / 2

Test Report

Common Information

EUT : FX200
 Manufacturer : PASSTECH CO., LTD
 Test Site: SHIELD ROOM
 Operating Conditions : RFID_N
 Operator Name:
 Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak	Limit (dBμV)	Margin	Bandwidth	Line	Filter	Corr. (dB)
0.4245	40.35	57.36	17.01	9.000	N	OFF	9.6
0.4380	39.96	57.10	17.14	9.000	N	OFF	9.6
0.4560	41.78	56.77	14.99	9.000	N	OFF	9.6
0.4695	41.66	56.52	14.86	9.000	N	OFF	9.6
0.4763	41.63	56.40	14.78	9.000	N	OFF	9.6
0.4875	40.42	56.21	15.79	9.000	N	OFF	9.6
1.1323	33.51	56.00	22.49	9.000	N	OFF	9.7
1.2380	34.18	56.00	21.82	9.000	N	OFF	9.7
1.3100	34.00	56.00	22.00	9.000	N	OFF	9.7
1.3280	34.92	56.00	21.08	9.000	N	OFF	9.7
1.3348	34.87	56.00	21.13	9.000	N	OFF	9.7
1.3415	34.43	56.00	21.57	9.000	N	OFF	9.7
8.6360	28.45	60.00	31.55	9.000	N	OFF	10.0
9.4145	29.89	60.00	30.11	9.000	N	OFF	10.1
9.4235	33.84	60.00	26.16	9.000	N	OFF	10.1
9.4370	30.79	60.00	29.21	9.000	N	OFF	10.1
22.4083	23.22	60.00	36.78	9.000	N	OFF	10.6
23.9990	33.59	60.00	26.41	9.000	N	OFF	10.7

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오전 9:54:12



Test

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Final Result_CAV

Frequency (MHz)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.3008	18.12	50.22	32.10	9.000	N	OFF	9.6
0.3255	18.35	49.57	31.22	9.000	N	OFF	9.6
0.4313	22.78	47.23	24.44	9.000	N	OFF	9.6
0.4628	23.58	46.64	23.06	9.000	N	OFF	9.6
0.4718	22.90	46.48	23.58	9.000	N	OFF	9.6
0.4853	22.93	46.25	23.32	9.000	N	OFF	9.6
1.0985	16.61	46.00	29.39	9.000	N	OFF	9.7
1.1278	16.66	46.00	29.34	9.000	N	OFF	9.7
1.1570	16.14	46.00	29.86	9.000	N	OFF	9.7
1.2425	17.16	46.00	28.84	9.000	N	OFF	9.7
1.3078	17.46	46.00	28.54	9.000	N	OFF	9.7
1.3348	17.30	46.00	28.70	9.000	N	OFF	9.7
8.6383	23.22	50.00	26.78	9.000	N	OFF	10.0
9.4235	27.63	50.00	22.37	9.000	N	OFF	10.1
22.0775	15.45	50.00	34.55	9.000	N	OFF	10.6
22.1405	17.07	50.00	32.93	9.000	N	OFF	10.6
22.3430	15.51	50.00	34.49	9.000	N	OFF	10.6
24.0013	29.28	50.00	20.72	9.000	N	OFF	10.7

2021-05-27

오전 9:54:12

10. LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	09/04/2020	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/05/2020	Annual	100033
ESPACE	SU-642 / Temperature Chamber	03/15/2021	Annual	0093008124
Agilent	N9020A / Signal Analyzer	04/16/2021	Annual	MY50210191
Agilent	N9030A / Signal Analyzer	01/11/2021	Annual	MY49431210
Agilent	N1911A / Power Meter	04/08/2021	Annual	MY45100523
Agilent	N1921A / Power Sensor	06/08/2020	Annual	MY57820067
Agilent	87300B / Directional Coupler	11/10/2020	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	05/20/2021	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/12/2020	Annual	KR75303960
H+S	5910-N-50-010 / Attenuator(10 dB)	10/28/2020	Annual	00801
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A
Rohde & Schwarz	CBT / Bluetooth Tester	05/04/2021	Annual	100422

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Emco	2090 / Controller	N/A	N/A	060520
Ets	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	03/19/2020	Biennial	1513-333
Schwarzbeck	VULB 9160 / Hybrid Antenna	08/19/2020	Biennial	9160-3368
Schwarzbeck	VULB 9168 / Hybrid Antenna	09/04/2020	Biennial	9168-0895
Schwarzbeck	BBHA 9120D / Horn Antenna	11/18/2019	Biennial	9120D-1191
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	11/29/2019	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	09/14/2020	Annual	836650/016
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/22/2020	Annual	101068-SZ
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	01/06/2021	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	02/08/2021	Annual	1
CERNEX	CBLU1183540B-01/Broadband Bench Top LNA	12/23/2020	Annual	N/A
WEINSCHTEL	56-10 / Attenuator(10 dB)			
CERNEX	CBL06185030 / Broadband Low Noise Amplifier	12/23/2020	Annual	N/A
Api tech.	18B-03 / Attenuator (3 dB)			
Wainwright Instruments	WHKX10-2700-3000-18000-40SS / High Pass Filter	12/23/2020	Annual	N/A
Wainwright Instruments	WHKX8-6090-7000-18000-40SS / High Pass Filter	12/23/2020	Annual	N/A
T&M SYSTEM	COAXIAL ATTENUATOR / Thru	12/23/2020	Annual	N/A
CERNEX	CBL18265035 / Power Amplifier	12/04/2020	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	03/23/2021	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/09/2021	Annual	3000C000276

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).

11. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2105-FC044-P