# FCC TEST REPORT

| | |
|---|---|
| Test report No.: | EMC- FCC- R0170 |
| FCC ID: | TKWXPS2M |
| Type of equipment: | Xpass S2 |
| Model Name: | XPS2M |
| Applicant: | suprema |
| FCC Rule Part(s): | FCC Part 15 Subpart C 15.225 |
| Frequency Range: | 13.533 ㎒ ~ 13.567 ㎒ |
| Test result: | Complied |

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only.
Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of receipt: 2014. 05. 16

Date of test: 2014. 05. 22 ~ 06. 13

Issued date: 2014. 07. 04

**Tested by:** BAEK, DONG HUN

**Approved by:** YU, SANG HOON


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# 1. Client information

| | |
|---|---|
| **Applicant:** | suprema |
| **Address:** | 16F Parkview Office Tower, Jeongja-dong, Bundang-gu, Seongnam, Gyeonggi, 463-863 Korea |
| **Telephone number:** | +82-31-710-2443 |
| **Facsimile number:** | +82-31-783-4516 |
| **Contact person:** | Daejin Kwon / djkwon@wuprema.co.kr |

| | |
|---|---|
| **Manufacturer:** | suprema |
| **Address:** | 16F Parkview Office Tower, Jeongja-dong, Bundang-gu, Seongnam, Gyeonggi, 463-863 Korea |


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# 2. Laboratory information

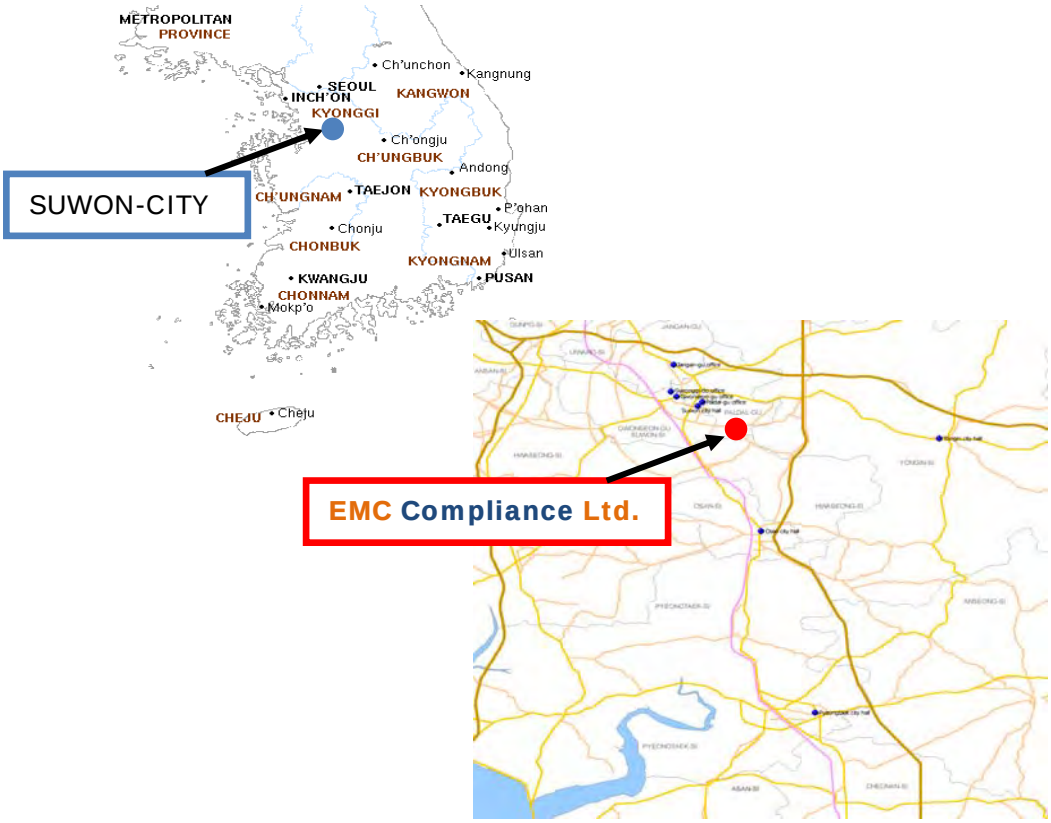
## Address

**EMC compliance Ltd.**
65, Sinwon-ro, Yeongtong-gu, Suwon- si, Gyeonggi-do, 443-390, Korea
Telephone Number: 82-31-336-9919  Facsimile Number: 82-505-299-8311

## Certificate

KOLAS No.: 231
FCC Site Registration No.: 687132
VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849
IC Site Registration No.:8035A-2

## SITE MAP





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# 3. Description of E.U.T.

## 3.1 Basic description

| | |
|---|---|
| **Applicant :** | suprema |
| **Address of Applicant:** | 16F Parkview Office Tower, Jeongja-dong, Bundang-gu, Seongnam, Gyeonggi, 463-863 Korea |
| **Manufacturer:** | suprema |
| **Address of Manufacturer:** | 16F Parkview Office Tower, Jeongja-dong, Bundang-gu, Seongnam, Gyeonggi, 463-863 Korea |
| **Type of equipment:** | Xpass S2 |
| **Basic Model:** | XPS2M |
| **Serial number:** | Engineering Sample |

## 3.2 General description

| | |
|---|---|
| **Operating Frequency** | 13.560 3 ㎒ |
| **Freqyency Range** | 13.533 ㎒ ~ 13.567 ㎒ |
| **Type of Modulation** | ASK |
| **Number of Channels** | 1 channel |
| **Type of Antenna** | Integral Type |
| **Power supply** | DC 12 V |
| **Operating temperature** | -35℃ ~ 65 ℃ |
| **Dimension** | 80 X 120 X 11.4 ㎜ |

## 3.3 Test frequency

| | |
|---|---|
| **frequency** | **13.560 3 ㎒** |


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# 4. Summary of test results

## 4.1 Standards & results

| Rule Reference | Parameter | Status |
|---|---|---|
| 15.225 (a) | In-band Fundamental Emission | C |
| 15.225 (b) | In-band Spurious Emission | C |
| 15.225 (c) | In-band Spurious Emission | C |
| 15.225 (d)<br>15.209 | Out-of–band Spurious Emission | C |
| 15.225 (e) | Frequency Stability Tolerance | C |
| 15.207 | Conducted Emissions | N/A |

Note: C=complies
NC= Not complies
NT=Not tested
NA=Not Applicable

* The test is not applicable since the EUT is not the device that is designed to be connected to the public utility(AC) power line.

## 4.2 Uncertainty

| Measurement Item | Expanded Uncertainty<br>U = KUc (K = 2) | |
|---|---|---|
| Frequency Stability Tolerance | ± 6.11 ㎑ | |
| Radiated Spurious Emissions | 30 ㎒ ~ 300 ㎒: | + 4.86 dB, - 4.88 dB |
| | 300 ㎒ ~ 1 000 ㎒: | + 4.98 dB, - 4.99 dB |


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# 5. Test results

## 5.1 In-band Fundamental Emission

### 5.1.1 Minimum Standard

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

### 5.1.2 Measurement Procedure

Test Procedure The Radiated Electric Field Strength intensity has been measured on semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9 ㎑ to 30 ㎒ at distance 3m The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

Frequency : From 30 ㎒ to 1 ㎓ at distance 3m The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector. The radiated emission measurements were made with the following detector function of the test receiver (below 1 ㎓).

| Freq' | 9 - 90 ㎑ | 90 - 110 ㎑ | 150 - 490 ㎑ | 490 ㎑ - 30 ㎒ | 30 ㎒ -1 ㎓ |
|---|---|---|---|---|---|
| Detecter type | PK/AV | QP | PK/AV | QP | QP |
| IF bandwidth | 200 ㎐ | 200 ㎐ | 9 ㎑ | 9 ㎑ | 120 ㎑ |

* Part 15 Section 15.31 (f)(2) (9 ㎑ - 30 ㎒)

[Limit at 3m]=[Limit at 300m]-40 x log(3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])


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5.1.3 Test Result

- Complies

| EUT | 13.56 MHz RF card reader | | |
|---|---|---|---|
| **Operating Frequency** | 13.560 3 ㎒ | **Model Name** | XPSM2 |
| **Operating Mode** | Transmitter Mode | **Modulation Technology** | ASK |
| **Environmental Condition** | 21℃/46 % | **Test Channel** | 1ch |

| Frequency | Reading (dBμV) | Correction Factor | field strength dBuV/m at 3 m |
|---|---|---|---|
| 13.560 3 ㎒ | 88.7 | -11.7 | 77.0 |
| **Maximum Level(dBμV/m)** | | | 25.5 |
| **Limit(dBμV/m) at 3m** | | | 124 dBμV/m |
| **margin** | | | 47.0 |

Note: Field strength limit was calculated with 40 dB/dec


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## 5.2 In-band Spurious Emission

### 5.2.1 Regulation

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

15.225 (c) With in the bands 13.110-13.410 ㎒ and 13.710-14.010 ㎒, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

### 5.2.2 Test Result

- Complied

DC 12V
Measurement Distance: 3 m

| Frequency [㎒] | Receiver Bandwidth [㎑] | Reading [dB(㎶)] | Pol. [V/H] | Factor [dB] | Limit [dB(㎶/m)] | Result [dB(㎶/m)] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| **QP DATA** | | | | | | | |
| 13.142 | 9 | 55.2 | H | -11.7 | 90.5 | 43.5 | 47.0 |
| 13.553 | 9 | 76.9 | V | -11.7 | 80.5 | 65.2 | 15.3 |
| 13.568 | 9 | 81.3 | H | -11.7 | 80.5 | 69.6 | 10.9 |
| 13.780 | 9 | 56.4 | V | -11.7 | 90.5 | 44.7 | 45.8 |

**Margin (dB) = Limit – Actual**
**[Resultl = Reading – Amp Gain + Attenuator + AF + CL]**
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10 dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss


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## 5.3 Out-of-band Spurious Emission

### 5.3.1 Regulation

15.225 (d) The Field Strength of any emissions appearing outside of the 13.110-14.010 ㎒ band shall not exceed the general radiated emission limits in 15.209

| Frequency (㎒) | Field Strength (㎶/m) | Measurement distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(㎑) | 300 |
| 0.490-1.705 | 24000/F(㎑) | 30 |
| 1.705-30.0 | 30(29.54 dB㎶/m) | 30 |
| 30.0-88.0 | 100(40 dB㎶/m) | 3 |
| 88-216 | 150(43.5 dB㎶/m) | 3 |
| 216-960 | 200 (46 dB㎶/m) | 3 |
| Above 960 | 500 (53.98 dB㎶/m) | 3 |
| | | |

### 5.3.2 Measurement Procedure

The spurious emissions from the EUT will be measured on an 10 m Anechoic chamber in the frequency range of 9 ㎑ to 30 ㎒ using a tuned receiver and a shielded loop antenna.
The antenna was positioned 3, 10 or 30 meters horizontally from the EUT.
Measurements haver been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions.
In the case where larger measuring distances are required the results will extrapolated based on the values measuring on the closer distances according to Section 15.31 (f) (2) [2].

The final measurement will be performed with an EMI Riceiver set to Quasi Peak detector except for the frequency bands 9 ㎑ to 90 ㎑ and 110 to 490 ㎑ where an average detector will be used according to Section 15.209 (d) [2].

The final lever, expressed in dB㎶/m, is arrived at by taking the reading from the EMI receiver (Level dB㎶) and adding the antenna correction factor and cable loss fator (Factor dB) to it. This result then has to be compared with the relevant FCC limit. The resolution bandwith during the measurement is as follows:
9 ㎑ – 150 ㎑: ResBW: 200 ㎐
150 ㎑ – 30 ㎒: ResBW: 9 ㎑


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The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

The EUT was placed on the top of the 0.8 meter height, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

The antenna polarization was also changed from vertical to horizontal. The spectrum was canned from 30 to 1 000 ㎒ using the BILOG antenna.

To obain the final measurement data, the EUT was arranged on a turntable situated on a 10 m chamber. The EUT was tested at a distance 3 meters.

Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

## 5.3.3 Test Result

## -Complied

Measurement Distance: 3 m

DC 12 V

| Frequency [㎒] | Receiver Bandwidth [㎑] | Reading [dB(㎶)] | Pol. [V/H] | Factor [dB] | Limit [dB(㎶/m)] | Result [dB(㎶/m)] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| **QP DATA.** | | | | | | | |
| 0.020 | 9 | 77.0 | V | -11.3 | 127.7 | 65.7 | 62.0 |
| 0.493 | 9 | 48.1 | V | -12.7 | 73.8 | 35.4 | 38.4 |
| 23.001 | 9 | 41.8 | V | -10.7 | 69.5 | 31.1 | 38.4 |
| 40.670 | 120 | 49.0 | H | -15.0 | 40.0 | 34.0 | 6.0 |
| 133.305 | 120 | 52.4 | H | -14.7 | 43.5 | 37.7 | 5.8 |
| 800.059 | 120 | 43.8 | H | -1.7 | 46.0 | 42.1 | 3.9 |
| 962.655 | 120 | 32.0 | H | 2.0 | 54.0 | 34.0 | 20.0 |

**Margin (dB) = Limit – Actual**
**[Resultl = Reading – Amp Gain + Attenuator + AF + CL]**
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10 dB pad and/or Insertion Loss of HPF), AF/CL = Antenna Factor and Cable Loss

* The spurious emission at the frequency does not fall in the restricted bands.
** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.

NOTE: All emissions not reported were more than 20 dB below the specified limit or in the noise floor.


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## 5.4 Frequency tolerance

### 5.4.1 Regulation

15.225 (e) 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.

### 5.4.2 Test Result

- Complied

DC 12V

| VOLTAGE (%) | POWER (V) | TEMP (℃) | FREQ (㎐) | FREQ.DEV (㎐) | Deviation (%) |
|---|---|---|---|---|---|
| 100 | 12 | 20 | 135 603 20 | -20 | -0.000 15 |
| | | -20 | 135 602 13 | 87 | 0.000 64 |
| | | -10 | 135 602 74 | 26 | 0.000 19 |
| | | 0 | 135 602 93 | 7 | 0.000 05 |
| | | 10 | 135 603 25 | -25 | -0.000 18 |
| | | 20 | 135 603 32 | -32 | -0.000 24 |
| | | 25 | 135 603 26 | -26 | -0.000 19 |
| | | 30 | 135 603 22 | -22 | -0.000 16 |
| | | 40 | 135 603 23 | -23 | -0.000 17 |
| | | 50 | 135 603 26 | -26 | -0.000 19 |
| 85 | 10.2 | 20 | 135 603 27 | -27 | -0.000 20 |
| 115 | 13.8 | 20 | 135 603 28 | -28 | -0.000 21 |


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## 6. Test equipment used for test

| | Description | Manufacture | Model No. | Serial No. | Next Cal Date. |
|---|---|---|---|---|---|
| ■ | Spectrum Analyzer | R&S | FSP40 | 100209 | 14.10.21 |
| ■ | Loop Antenna | R&S | HFH2-Z2 | 100355 | 15.06.19 |
| ■ | Bi-Log Antenna | Schwarzbeck | VULB9163 | 552 | 14.07.18 |
| ■ | Attenuator | HP | 8491A | 16861 | 14.07.08 |
| ■ | Antenna Mast | Innco Systems | MA4000-EP | 303 | - |
| ■ | Turn Table | Innco Systems | DT2000S-1t | 79 | - |
| ■ | DC Power Supply | Tektronix | PS2520G | TW50517 | 14.10.21 |
| ■ | Signal Generator | R&S | SMR40 | 100007 | 15.03.25 |


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