

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 MHz ~ 13.567 MHz
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

[Contents]

1. Client information	3
2. Laboratory information	4
3. Description of E.U.T.	5
3.1 Basic description	5
3.2 General description.....	5
3.3 Test frequency.....	5
4. Summary of test results	6
4.1 Standards & results	6
4.2 Uncertainty	6
5. Test results	7
5.1 In-band Fundamental Emission	7
5.2 In-band Spurious Emission.....	9
5.3 Out-of-band Spurious Emission	10
5.4 Frequency tolerance.....	12
6. Test equipment used for test	13

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

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



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

3.3 Test frequency

frequency	13.560 3 MHz
------------------	---------------------

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) 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 $U = KUc (K = 2)$	
Frequency Stability Tolerance	± 6.11 kHz	
Radiated Spurious Emissions	30 MHz ~ 300 MHz:	+ 4.86 dB, - 4.88 dB
	300 MHz ~ 1 000 MHz:	+ 4.98 dB, - 4.99 dB

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 MHz 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 kHz to 30 MHz 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 MHz to 1 GHz 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 GHz).

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

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

[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])

5.1.3 Test Result

- Complies

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

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

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

5.2 In-band Spurious Emission

5.2.1 Regulation

15.225 (b) With in 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.

15.225 (c) With in 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.

5.2.2 Test Result

- Complied

DC 12V

Measurement Distance: 3 m

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μ V)]	Pol. [V/H]	Factor [dB]	Limit [dB(μ V/m)]	Result [dB(μ V/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

[Result] = 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

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 MHz band shall not exceed the general radiated emission limits in 15.209

Frequency (MHz)	Field Strength ($\mu V/m$)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30(29.54 dB $\mu V/m$)	30
30.0-88.0	100(40 dB $\mu V/m$)	3
88-216	150(43.5 dB $\mu V/m$)	3
216-960	200 (46 dB $\mu V/m$)	3
Above 960	500 (53.98 dB $\mu V/m$)	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 kHz to 30 MHz using a tuned receiver and a shielded loop antenna.

The antenna was positioned 3, 10 or 30 meters horizontally from the EUT.

Measurements have 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 be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2].

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

The final level, expressed in dB $\mu V/m$, is arrived at by taking the reading from the EMI receiver (Level dB μV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit. The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: ResBW: 200 Hz

150 kHz – 30 MHz: ResBW: 9 kHz

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 scanned from 30 to 1 000 MHz using the BILOG antenna.

To obtain 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 [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Factor [dB]	Limit [dB(μV/m)]	Result [dB(μV/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

[Result] = 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.

5.4 Frequency tolerance

5.4.1 Regulation

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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 (°C)	FREQ (Hz)	FREQ.DEV (Hz)	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

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