

EMI TEST REPORT

FCC CERTIFICATION

Applicant:**SAMSUNG Electronics Co., Ltd.**

(Maetan dong) 129, Samsung-ro Yeongtong-gu,
Suwon-si, Gyeonggi-do 16677, Korea

Date of Receipt: May 03, 2016**Date of Issue: May 11, 2016****Test Report No. HCT-E-1605-F009****HCT FRN: 0005866421****FCC ID :****A3LSMC5000**

Rule Part(s) / Standard(s): FCC CFR 47 PART 15 Subpart B Class B
FCC Classification: JBP (Part 15 B – Class B Computing Device Peripheral)
EUT Type: Mobile Phone
Model Name: SM-C5000
Test Port: Micro USB / Earphone Port
Date of Test: May 09, 2016 - May 10, 2016

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT certifies that no party to application has been denial the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

Yeong-Moo Kim
Test Engineer
EMC Team
Certification Division

Reviewed By

Jin-Pyo Hong
Technical Manager
EMC Team
Certification Division

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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1605-F009	May 11, 2016	Initial Release



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ATTACHMENT: TEST SETUP PHOTOGRAPHS



1. GENERAL INFORMATION

1.1 Description of EUT

Its basic purpose is used for communications.

Model	SM-C5000
FCC ID	A3LSMC5000
EUT Type	Mobile Phone
TX Frequency	824.20 MHz to 848.80 MHz (GSM 850) 1 850.20 MHz to 1 909.80 MHz (GSM 1 900) 1 852.4 MHz to 1 907.6 MHz (WCDMA B2) 826.40 MHz to 846.60 MHz (WCDMA B5) 2 496 MHz to 2 690 MHz (LTE B41)
RX Frequency	869.20 MHz to 893.80 MHz (GSM 850) 1 930.20 MHz to 1 989.80 MHz (GSM 1 900) 1 932.4 MHz to 1 987.6 MHz (WCDMA B2) 871.40 MHz to 891.60 MHz (WCDMA B5) 2 496 MHz to 2 690 MHz (LTE B41)

1.2 Related Submittal(s) / Grant(s)

Original submittal only.



1.3 Test Facility

Test site is located at 74, SEOICHEON-RO, 578BEON-GIL, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, KOREA. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2003.

Measurement Facilities	Reg. No.
HCT FRN: 0005866421 Radiated Field strength measurement facility (3 m)	90661 (February 28, 2014)
HCT FRN: 0005866421 Radiated Field strength measurement facility (10 m)	90661 (February 28, 2014)



1.4 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Manufacturer	FCC ID / DoC	Connected To
EUT	SM-C5000	SAMSUNG	A3LSMC5000	Notebook PC, Earphone
USB cable	EP-DG915UWE	KSD	-	EUT, Notebook PC
Earphone	EHS64AVFWE	CRESYN	-	EUT
Notebook PC	ProBook6560b	HP	DoC	EUT, Notebook PC adaptor, RJ45 cable, Serial mouse
Notebook PC adaptor	PPP009D	DELTA Electronics (Jiangsu) LTD	-	Notebook PC
Gateway	TL-WR747N	TP-LINK	-	RJ45 cable, Gateway adaptor
Gateway adaptor	T120150-2H1	TP-LINK	-	Gateway
Serial mouse	Serial 2 button mouse	Radio shack	FSUGMZE3	Notebook PC
RJ45 cable	-	-	-	Notebook PC, Gateway
SD card	MB-SD32D	Samsung	-	EUT



1.5 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	Micro USB	Y	Y	(P,D)1.2
	Earphone	N/A	Y	(D)1.2
Notebook PC	RJ 45	N/A	N	(D)2.5
	Serial (Mouse)	N/A	Y	(D)1.8
	DC in	N	N/A	(P)1.8
Gateway	DC in	N	N/A	(P)1.8

* The marked “(D)” means the data cable and “(P)” means the power cable.

1.6 Noise Suppression Parts on Cable. (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	Micro USB	N	N/A	Y	Both End
	Earphone	N	N/A	Y	Both End
Notebook PC	RJ 45	N	N/A	N	N/A
	Serial (Mouse)	N	N/A	Y	Notebook PC End



2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2003

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

[Conducted Emission Limits]

Frequency (MHz)	Resolution Bandwidth (kHz)	Quasi-Peak (dB(μV))	Average (dB(μV))
0.15 to 0.5	9	66 to 56*	56 to 46*
0.5 to 5	9	56	46
5 to 30	9	60	50

**Decreases with the logarithm of the frequency.*



2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2003, Clause 8

- a. The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to Peak and Average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- g. The antenna height scans apply for both horizontal and vertical polarizations, except that for vertical polarization, the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the lowest antenna element clears the site reference ground plane by at least 25 cm. (below 1 GHz)

[Radiated Emission Limits]

Frequency (MHz)	Antenna Distance (m)	Field Strength ($\mu\text{V}/\text{m}$)	Quasi-Peak ($\text{dB}(\mu\text{V})/\text{m}$)
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Peak ($\text{dB}(\mu\text{V})/\text{m}$)	Average ($\text{dB}(\mu\text{V})/\text{m}$)
Above 1 000	3	74	54

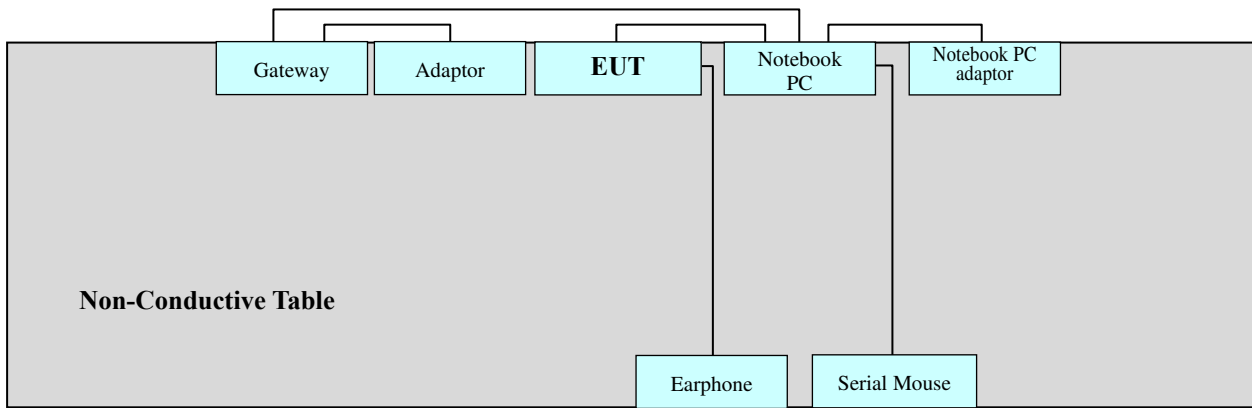


2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System



Power Line: 120 VAC, 60 Hz



3. PRELIMINARY TEST

3.1 Conducted Emission Test

It was tested Data Communication mode, after connecting all peripheral devices.

Operation Mode: Data Communication mode

3.2 Radiated Emission Test

It was tested Data Communication mode, after connecting all peripheral devices.

Operation Mode: Data Communication mode



4. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission Test

The test results of conducted emission at mains ports provide the following information:

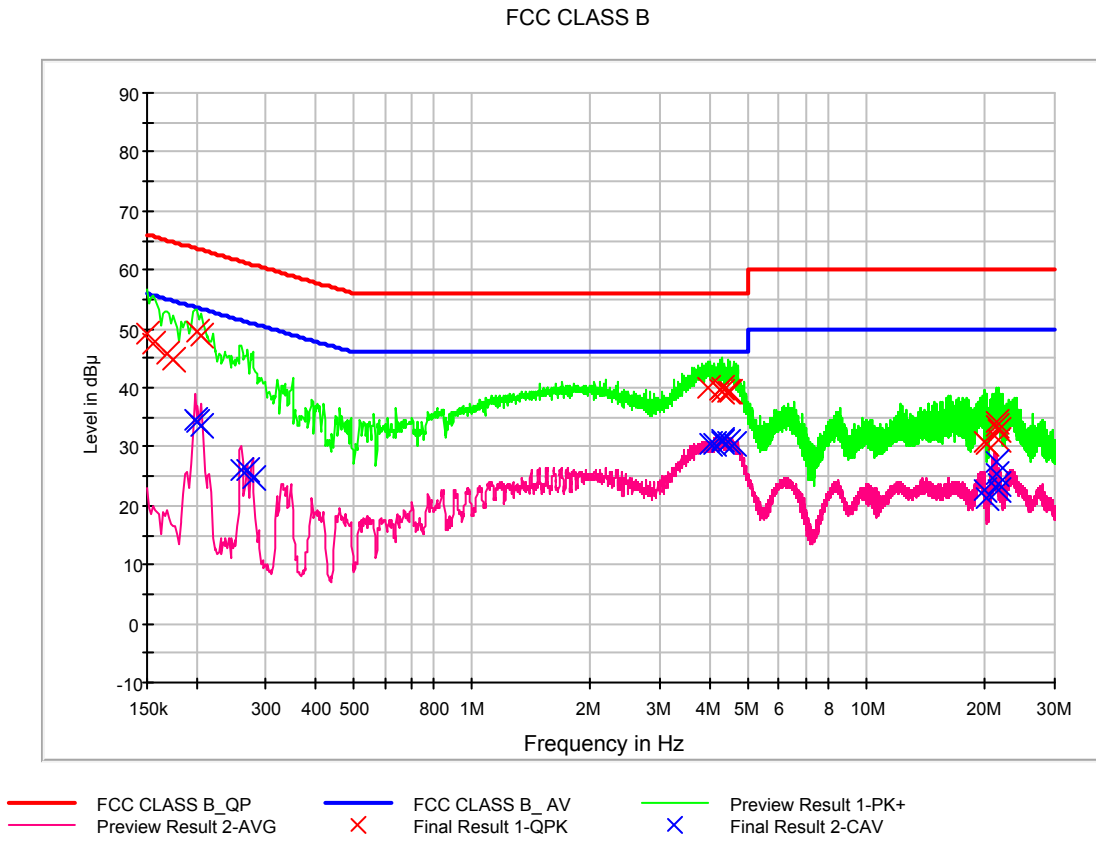
Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	Shielded Room
Temperature	24.8 °C
Relative Humidity	39.4 %
Test Date	May 09, 2016

- Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage



Figure 1: Spectral Diagrams, Conducted Emission (0.15 to 30) MHz, Line (L1)





QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	49.1	9.000	L1	9.7	16.9	66.0
0.156000	47.5	9.000	L1	9.6	18.1	65.7
0.168000	45.7	9.000	L1	9.6	19.4	65.1
0.174000	44.9	9.000	L1	9.6	19.9	64.8
0.200000	49.5	9.000	L1	9.6	14.1	63.6
0.206000	48.7	9.000	L1	9.6	14.7	63.4
3.956000	40.0	9.000	L1	9.8	16.0	56.0
4.240000	39.6	9.000	L1	9.8	16.4	56.0
4.290000	39.2	9.000	L1	9.8	16.8	56.0
4.310000	39.9	9.000	L1	9.8	16.1	56.0
4.454000	39.3	9.000	L1	9.8	16.7	56.0
4.522000	39.4	9.000	L1	9.9	16.6	56.0
19.946000	30.9	9.000	L1	10.2	29.1	60.0
20.070000	30.5	9.000	L1	10.3	29.5	60.0
21.270000	34.2	9.000	L1	10.3	25.8	60.0
21.482000	33.4	9.000	L1	10.3	26.6	60.0
21.554000	32.7	9.000	L1	10.3	27.3	60.0
21.628000	31.3	9.000	L1	10.3	28.7	60.0

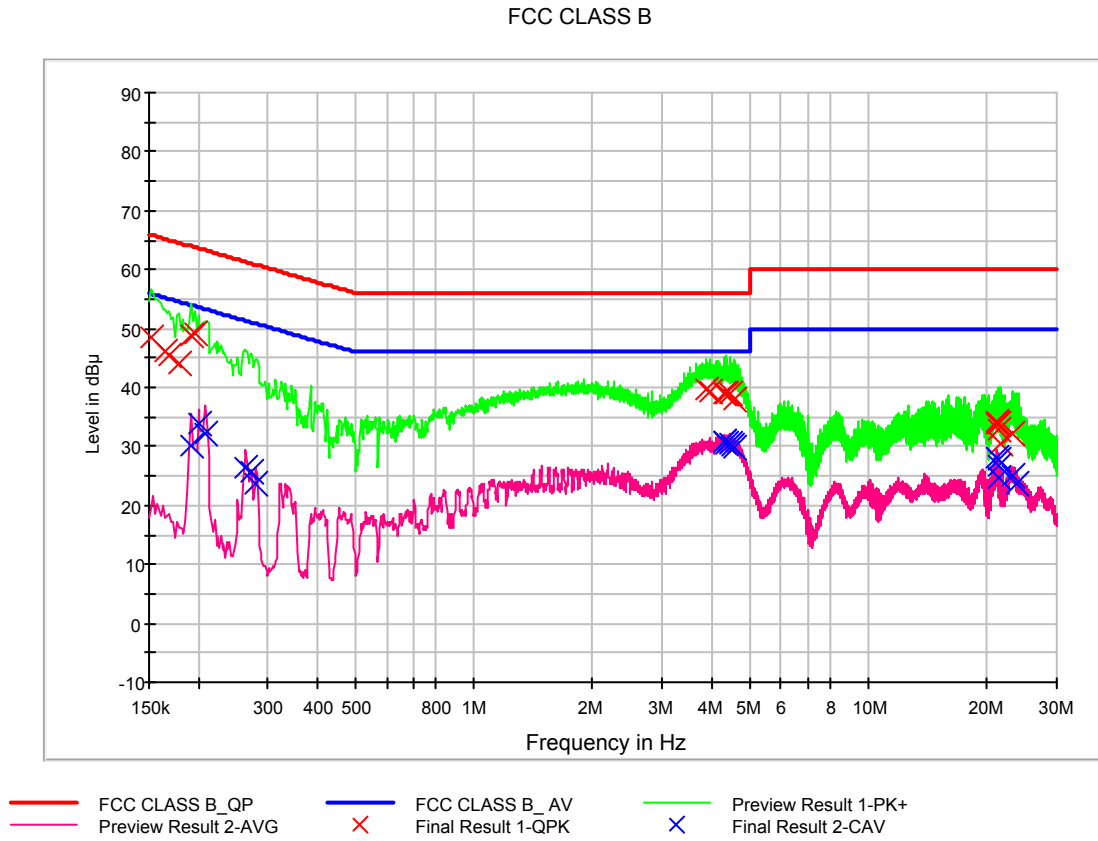


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.198000	34.5	9.000	L1	9.6	19.2	53.7
0.202000	34.3	9.000	L1	9.6	19.2	53.5
0.206000	33.5	9.000	L1	9.6	19.8	53.4
0.260000	26.2	9.000	L1	9.6	25.2	51.4
0.270000	26.1	9.000	L1	9.6	25.0	51.1
0.278000	24.8	9.000	L1	9.6	26.0	50.9
4.032000	30.6	9.000	L1	9.8	15.4	46.0
4.104000	30.6	9.000	L1	9.8	15.4	46.0
4.310000	31.3	9.000	L1	9.8	14.8	46.0
4.314000	31.0	9.000	L1	9.8	15.0	46.0
4.454000	30.8	9.000	L1	9.8	15.2	46.0
4.592000	30.6	9.000	L1	9.9	15.4	46.0
19.946000	22.7	9.000	L1	10.2	27.3	50.0
20.070000	21.1	9.000	L1	10.3	28.9	50.0
21.270000	27.4	9.000	L1	10.3	22.6	50.0
21.412000	25.5	9.000	L1	10.3	24.6	50.0
21.554000	23.6	9.000	L1	10.3	26.4	50.0
21.628000	22.5	9.000	L1	10.3	27.5	50.0



Figure 2: Spectral Diagrams, Conducted Emission (0.15 to 30) MHz, Line (N)





QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	48.3	9.000	N	9.6	17.6	65.9
0.164000	46.0	9.000	N	9.6	19.2	65.3
0.168000	45.4	9.000	N	9.6	19.7	65.1
0.178000	44.0	9.000	N	9.6	20.5	64.6
0.192000	48.9	9.000	N	9.6	15.0	63.9
0.196000	49.3	9.000	N	9.6	14.5	63.8
3.888000	39.6	9.000	N	9.8	16.4	56.0
3.958000	39.2	9.000	N	9.8	16.8	56.0
4.310000	39.0	9.000	N	9.8	17.0	56.0
4.380000	38.9	9.000	N	9.8	17.1	56.0
4.450000	38.9	9.000	N	9.8	17.1	56.0
4.590000	38.1	9.000	N	9.8	17.9	56.0
21.050000	34.1	9.000	N	10.3	25.9	60.0
21.056000	33.9	9.000	N	10.3	26.1	60.0
21.264000	33.8	9.000	N	10.3	26.2	60.0
21.404000	32.9	9.000	N	10.3	27.1	60.0
21.690000	30.4	9.000	N	10.3	29.6	60.0
23.314000	32.1	9.000	N	10.4	27.9	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.192000	30.1	9.000	N	9.6	23.9	53.9
0.200000	34.0	9.000	N	9.6	19.7	53.6
0.208000	32.2	9.000	N	9.6	21.1	53.3
0.264000	26.4	9.000	N	9.6	25.0	51.3
0.272000	25.7	9.000	N	9.6	25.4	51.1
0.280000	23.5	9.000	N	9.6	27.3	50.8
4.288000	30.7	9.000	N	9.8	15.3	46.0
4.310000	30.8	9.000	N	9.8	15.2	46.0
4.380000	30.4	9.000	N	9.8	15.6	46.0
4.450000	30.4	9.000	N	9.8	15.6	46.0
4.522000	30.0	9.000	N	9.8	16.0	46.0
4.590000	29.7	9.000	N	9.8	16.3	46.0
21.054000	28.0	9.000	N	10.3	22.0	50.0
21.256000	27.7	9.000	N	10.3	22.3	50.0
21.264000	26.8	9.000	N	10.3	23.2	50.0
21.406000	24.7	9.000	N	10.3	25.3	50.0
23.310000	25.2	9.000	N	10.4	24.8	50.0
23.804000	23.8	9.000	N	10.4	26.2	50.0



4.2 Radiated Emission Test

The test results of radiated emission provide the following information:

-For Measurement Below 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	22.7 °C
Relative Humidity	39.6 %
Test Date	May 09, 2016

Frequency (MHz)	Quasi Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
54.086653	34.5	100.0	V	96.0	15.8	5.5	40.0
58.798317	31.4	350.0	V	294.0	15.5	8.6	40.0
63.486092	33.8	400.0	H	6.0	15.0	6.2	40.0
68.184210	32.9	100.0	H	211.0	14.3	7.1	40.0
72.885531	31.5	143.0	H	163.0	13.5	8.5	40.0
266.514309	33.2	125.0	H	140.0	16.9	12.8	46.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak



-For Measurement Above 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Operating Frequency	1.5 GHz / WiFi: 5.825 GHz
Testing Frequency Range	1 GHz to 29.125 GHz
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	22.7 / 23.3 °C
Relative Humidity	39.6 / 43.6 %
Test Date	May 09 / May 10, 2016

Frequency (MHz)	Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1332.314630	49.1	144.0	V	125.0	-9.8	24.9	74.0
1399.949900	47.4	204.0	V	41.0	-9.6	26.6	74.0
1998.947896	54.9	100.0	V	228.0	-8.4	19.1	74.0
2077.304610	49.8	100.0	V	229.0	-8.1	24.2	74.0

Frequency (MHz)	CAverage (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
1332.314630	31.3	144.0	V	125.0	-9.8	22.7	54.0
1399.949900	44.4	204.0	V	41.0	-9.6	9.6	54.0
1998.947896	36.7	100.0	V	228.0	-8.4	17.3	54.0
2077.304610	33.6	100.0	V	229.0	-8.1	20.4	54.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage



5. LIST OF TEST EQUIPMENT

<u>Type</u>	<u>Manufacturer</u>	<u>Model Name</u>	<u>Serial Number</u>	<u>Calibration Cycle</u>	<u>CAL Date</u>
<u>Conducted Emission</u>					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	12.28.2015
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ESH3-Z5	100282	1 year	06.11.2015
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ENV216	100073	1 year	12.28.2015
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
<input checked="" type="checkbox"/> Trilog Antenna	Schwarzbeck	VULB9160	3301	2 year	11.17.2014
<input checked="" type="checkbox"/> Antenna master	HD GmbH	MA240	240/520	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
<input checked="" type="checkbox"/> Turn Table	EMCO	1060-2M	-	N/A	-
<input checked="" type="checkbox"/> Turn Table controller	EMCO	2090	9702-1224	N/A	-
<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.05.2015
<input type="checkbox"/> Antenna master	INNCO Systems	MA4000-EP	MA4000/283	N/A	-
<input type="checkbox"/> Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-
-For measurement above 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
<input checked="" type="checkbox"/> Antenna master	HD GmbH	MA240	240/520	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
<input checked="" type="checkbox"/> Turn Table	EMCO	1060-2M	-	N/A	-
<input checked="" type="checkbox"/> Turn Table controller	EMCO	2090	9702-1224	N/A	-
<input type="checkbox"/> Power Amplifier	CERNEX	CBLU1183540	21691	1 year	07.06.2015
<input checked="" type="checkbox"/> Power Amplifier	CERNEX	CBLU5183530	24348	1 year	06.15.2015
<input checked="" type="checkbox"/> Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	10.07.2014
<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.05.2015
<input type="checkbox"/> Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-



6. CONCLUSION

The data collected shows that the **EUT Type: Mobile Phone, Model: SM-C5000, FCC ID: A3LSMC5000** complies with §15.107 and §15.109 of the FCC rules.