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EMI TEST REPORT
FCC CERTIFICATION

Applicant: **SAMSUNG Electronics Co., Ltd.** **129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea**	**Date of Issue: December 26, 2018** **Test Report No. HCT-EM-1812-FC029** **Test Site: HCT CO., LTD.**

FCC ID : **A3LSMM105F**

Applicable Standards	: FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
EUT Type	: Mobile Phone
Model Name	: SM-M105F/DS
Date of Test	: December 24, 2018 to December 26, 2018

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 C63.4-2014. (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

Na-Eun Song
Test Engineer
EMC Team
Certification Division

Reviewed By

Jin-Pyo Hong
Technical Manager
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REVISION HISTORY

The revision history for this document is shown in table.

Report No.	Issue Date	Information About Changes
HCT-EM-1812-FC029	December 26, 2018	Initial Release

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1. GENERAL INFORMATION

1.1 Description of EUT

Its basic purpose is used for communications.

FCC ID	A3LSMM105F
Model	SM-M105F/DS
EUT Type	Mobile Phone
Frequency Band	GSM 850, WCDMA B5, LTE B5/B41, BT BDR/EDR/LE, WLAN b/g/n

1.2 Equipment Units Tested

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

Device Type	Model Name	Serial Number	Manufacturer	FCC ID / DoC
EUT	SM-M105F/DS	-	SAMSUNG	A3LSMM105F
TA	ETA0U84IWE	-	SALCOMP	-
Data Cable	ECB-DU68WE	-	RFTech	-
Earphone	EHS64AVFWE	-	YOUNGBO	-

1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	Micro USB	Y	N/A	(P) 1.0
	Earphone	N/A	N	(D) 1.2

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

1.4 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	EUT End

1.5. Test Facility

Test site is located at 74, SEOICHEON-RO, 578BEON-GIL, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, SOUTH KOREA. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Registration Number
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	90661
Radiated Field strength measurement facility 10 m Semi Anechoic chamber	

1.6 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards.
Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

1.7 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.
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 Emission (0.15 MHz to 30 MHz)	1.82 dB
Radiated Emissions (30 MHz to 1 GHz)	5.20 dB
Radiated Emissions (1 GHz to 18 GHz)	5.24 dB
Radiated Emissions (18 GHz to 40 GHz)	5.40 dB

2. LIST OF TEST EQUIPMENT

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	CAL Date
Conducted Emission						
☒	EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.25.2018
☒	LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
☒	LISN	Rohde & Schwarz	ENV216	100073	1 year	05.03.2018
☒	Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.21.2018
☒	Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒	Software	Rohde & Schwarz	EMC32 VER8.54.0	-	-	-
Radiated Emission						
-For measurement below 1 GHz						
☒	EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	07.27.2018
☒	Trilog Antenna	Schwarzbeck	VULB 9168	760	2 year	04.06.2017
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn Table	INNCO Systems	1060-2M	-	N/A	-
☒	Turn Table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.21.2018
☒	Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-
-For measurement above 1 GHz						
☒	EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	07.27.2018
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn Table	INNCO Systems	1060-2M	-	N/A	-
☒	Turn Table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Horn Antenna	Schwarzbeck	BBHA 9120D	01836	2 year	05.14.2018
☒	Low Noise Amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.06.2018
☐	Power Amplifier	TESTEK	TK-PA1840H	170030-L	1 year	12.17.2018
☐	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170#786	2 year	12.05.2017
☒	Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.21.2018
☒	Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒	Highpass Filter	Wainwright Instruments	WHKX1.0/15G-12SS	42	1 year	08.02.2018
☒	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

3. DESCRIPTION OF MEASUREMENTS

3.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

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.*

3.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
g. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.(1 GHz to 40 GHz)

[Radiated Emission Limits]

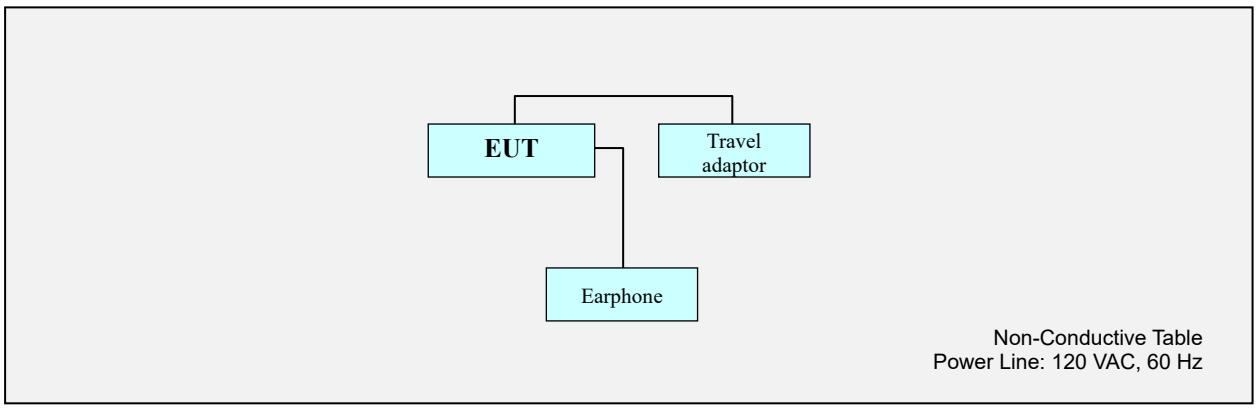
Frequency (MHz)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dB(μV)/m)
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Peak (dB(μV)/m)	Average (dB(μV)/m)
Above 1 000	3	74	54

3.2.1 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 ㎓, whichever is lower

3.3 Configuration of Tested System



4. PRELIMINARY TEST

During preliminary tests, the following operating mode was investigated.

LTE B5/ WCDMA 850/ GSM 850 Idle (869 MHz to 894 MHz) (Low/Middle/High CH)

4.1 Conducted Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes:

Charging & Receiver at LTE B5/ WCDMA 850/ GSM 850 Idle (Low/Middle/High CH)

NOTE.
1. The worst case of operating mode is reported.

4.2 Radiated Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes:

Charging & Receiver at LTE B5/ WCDMA 850/ GSM 850 Idle (Low/Middle/High CH)

NOTE.
1. Three orientations have been investigated and the worst case orientation is reported.
2. The worst case of operating mode is reported.

5. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

5.1 Conducted Emission

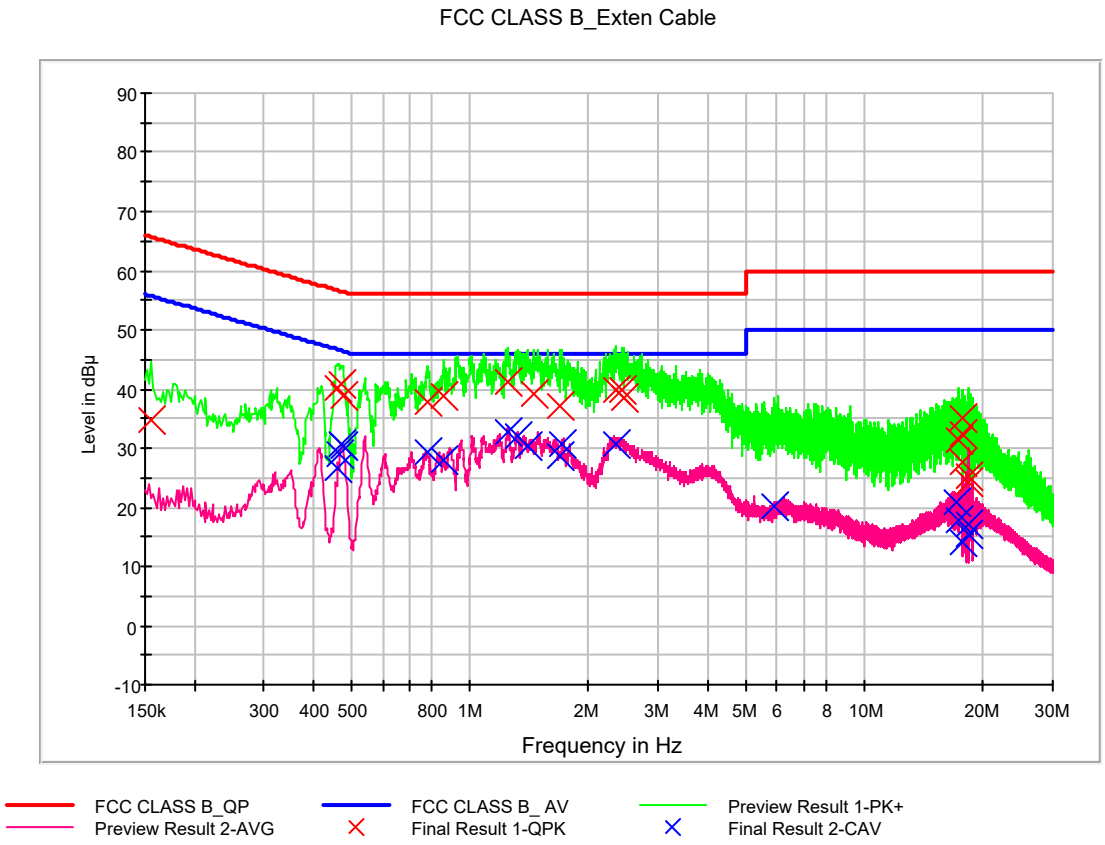
The test results of conducted emission at mains ports provide the following information:

Applicable Standards	FCC PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Worst Case of Operating Mode	Charging & Receiver at LTE B5/ WCDMA 850/ GSM 850 Idle (Low CH)
Kind of Test Site	Shielded Room
Temperature	22.5 °C
Relative Humidity	41.6 %
Test Date	December 26, 2018

- 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: Conducted Emission, Line (L1)



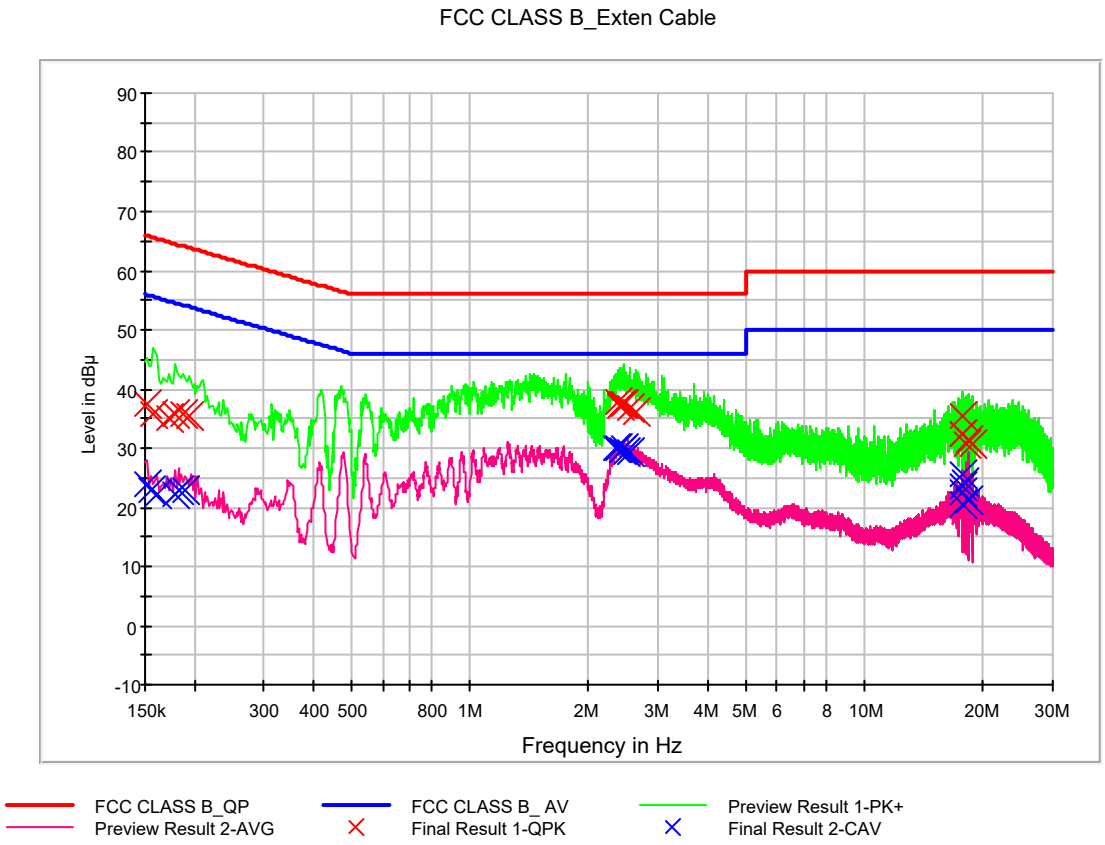
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.156000	34.8	9.000	L1	9.7	30.9	65.7
0.462000	40.0	9.000	L1	9.8	16.6	56.7
0.470000	40.9	9.000	L1	9.8	15.6	56.5
0.476000	38.8	9.000	L1	9.8	17.6	56.4
0.776000	38.0	9.000	L1	9.8	18.0	56.0
0.858000	38.7	9.000	L1	9.8	17.3	56.0
1.244000	41.3	9.000	L1	9.9	14.7	56.0
1.446000	39.1	9.000	L1	9.9	16.9	56.0
1.684000	37.2	9.000	L1	9.9	18.8	56.0
2.330000	39.7	9.000	L1	9.9	16.3	56.0
2.416000	39.7	9.000	L1	9.9	16.3	56.0
2.462000	38.6	9.000	L1	9.9	17.4	56.0
17.342000	31.3	9.000	L1	10.5	28.7	60.0
17.798000	34.9	9.000	L1	10.5	25.1	60.0
17.804000	32.2	9.000	L1	10.5	27.8	60.0
17.808000	27.7	9.000	L1	10.5	32.3	60.0
18.268000	24.2	9.000	L1	10.5	35.8	60.0
18.338000	25.3	9.000	L1	10.5	34.7	60.0

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.462000	26.7	9.000	L1	9.8	19.9	46.7
0.466000	29.1	9.000	L1	9.8	17.5	46.6
0.470000	30.7	9.000	L1	9.8	15.9	46.5
0.476000	30.5	9.000	L1	9.8	15.9	46.4
0.776000	29.2	9.000	L1	9.8	16.8	46.0
0.856000	27.9	9.000	L1	9.8	18.1	46.0
1.244000	32.8	9.000	L1	9.9	13.2	46.0
1.324000	31.9	9.000	L1	9.9	14.1	46.0
1.402000	30.3	9.000	L1	9.9	15.7	46.0
1.684000	28.6	9.000	L1	9.9	17.4	46.0
1.716000	30.7	9.000	L1	9.9	15.3	46.0
2.330000	30.8	9.000	L1	9.9	15.2	46.0
5.934000	20.1	9.000	L1	10.1	29.9	50.0
17.102000	20.7	9.000	L1	10.5	29.3	50.0
17.342000	17.8	9.000	L1	10.5	32.2	50.0
17.808000	14.1	9.000	L1	10.5	35.9	50.0
18.268000	15.4	9.000	L1	10.5	34.6	50.0
18.336000	17.2	9.000	L1	10.5	32.8	50.0

Figure 2: Conducted Emission, Line (N)



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	37.3	9.000	N	9.8	28.6	65.9
0.158000	35.7	9.000	N	9.8	29.9	65.6
0.172000	35.0	9.000	N	9.8	29.9	64.9
0.178000	35.7	9.000	N	9.8	28.9	64.6
0.188000	35.7	9.000	N	9.8	28.5	64.1
0.194000	35.3	9.000	N	9.8	28.5	63.9
2.376000	37.8	9.000	N	10.1	18.2	56.0
2.394000	37.0	9.000	N	10.1	19.0	56.0
2.414000	37.4	9.000	N	10.1	18.6	56.0
2.442000	37.5	9.000	N	10.1	18.5	56.0
2.538000	36.7	9.000	N	10.1	19.3	56.0
2.624000	36.1	9.000	N	10.1	19.9	56.0
17.800000	35.3	9.000	N	10.8	24.7	60.0
17.808000	32.5	9.000	N	10.8	27.5	60.0
17.812000	32.4	9.000	N	10.8	27.6	60.0
18.160000	30.6	9.000	N	10.8	29.4	60.0
18.354000	31.2	9.000	N	10.8	28.8	60.0
18.706000	30.8	9.000	N	10.8	29.2	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	23.7	9.000	N	9.8	32.1	55.9
0.156000	22.9	9.000	N	9.8	32.7	55.7
0.160000	22.1	9.000	N	9.8	33.4	55.5
0.178000	22.3	9.000	N	9.8	32.3	54.6
0.182000	22.7	9.000	N	9.8	31.7	54.4
0.190000	22.9	9.000	N	9.8	31.1	54.0
2.346000	29.9	9.000	N	10.1	16.1	46.0
2.376000	30.1	9.000	N	10.1	15.9	46.0
2.414000	29.7	9.000	N	10.1	16.3	46.0
2.448000	29.9	9.000	N	10.1	16.1	46.0
2.490000	29.4	9.000	N	10.1	16.6	46.0
2.538000	29.3	9.000	N	10.1	16.7	46.0
17.798000	25.7	9.000	N	10.8	24.3	50.0
17.804000	23.7	9.000	N	10.8	26.3	50.0
17.808000	22.7	9.000	N	10.8	27.3	50.0
17.812000	20.4	9.000	N	10.8	29.6	50.0
17.866000	24.1	9.000	N	10.8	25.9	50.0
18.350000	21.2	9.000	N	10.8	28.8	50.0

5.2 Radiated Emission

The test results of radiated emission provide the following information:

-For Measurement Below 1 GHz

Applicable Standards	FCC PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Worst Case of Operating Mode	Charging & Receiver at LTE B5/ WCDMA 850/ GSM 850 Idle (Low CH)
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.0 °C
Relative Humidity	41.1 %
Test Date	December 24, 2018

Frequency (MHz)	Quasi Peak (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
31.215200	23.5	99.8	V	276.0	18.8	16.5	40.0
32.508800	24.3	99.8	V	85.0	18.9	15.7	40.0
98.044000	19.0	208.9	H	134.0	15.3	24.5	43.5
106.553600	19.8	274.9	H	343.0	16.3	23.7	43.5
250.025600	24.8	225.1	V	143.0	18.8	21.2	46.0
631.433600	27.9	99.8	H	308.0	27.8	18.1	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

Applicable Standards	FCC PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Frequency	2 690 MHz
Tested Frequency Range	1 GHz to 18 GHz
Worst Case of Operating Mode	Charging & Receiver at LTE B5/ WCDMA 850/ GSM 850 Idle (Low CH)
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.0 °C
Relative Humidity	41.1 %
Test Date	December 24, 2018

Frequency (MHz)	Peak (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1376.660000	31.0	323.6	V	252.0	-28.3	43.0	74.0
1735.560000	31.4	350.0	H	63.0	-27.3	42.6	74.0
2682.035000	32.8	149.9	V	89.0	-24.2	41.2	74.0
3072.095000	33.8	150.0	V	50.0	-22.7	40.2	74.0
6392.360000	38.9	160.6	H	70.0	-15.5	35.1	74.0
7314.940000	41.1	350.0	H	207.0	-13.4	32.9	74.0

Frequency (MHz)	CAverage (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1376.660000	17.8	323.6	V	252.0	-28.3	36.2	54.0
1735.560000	18.4	350.0	H	63.0	-27.3	35.6	54.0
2682.035000	20.0	149.9	V	89.0	-24.2	34.0	54.0
3072.095000	21.0	150.0	V	50.0	-22.7	33.0	54.0
6392.360000	26.1	160.6	H	70.0	-15.5	27.9	54.0
7314.940000	27.7	350.0	H	207.0	-13.4	26.3	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

6. CONCLUSION

The data collected shows that the **EUT Type: Mobile Phone, FCC ID: A3LSMM105F, Model: SM-M105F/DS** complies with §15.107 and §15.109 of the FCC rules.

7. APPENDIX A. TEST SETUP PHOTOGRAPHS

Please refer to Appendix A