

EMI TEST REPORT

FCC CERTIFICATION

Applicant:

SAMSUNG Electronics Co., Ltd.
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Gyeonggi-do, 16677, Korea

Date of Issue: December 06, 2019**Test Report No. HCT-EM-1911-FC001-R2****Test Site: HCT CO., LTD.****FCC ID :****A3LSMR825**

Rule Part(s) / Standard(s) : 47 CFR PART 15 Subpart B Class B
ANSI C63.4-2014

Product Name : Smart Watch

Model Name : SM-R825F

Date of Test : November 12, 2019 to November 13, 2019

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 denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

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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-1911-FC001	November 13, 2019	Initial Release
HCT-EM-1911-FC001-R1	November 20, 2019	Revised the Model Name Revised the note in clause 4.2
HCT-EM-1911-FC001-R2	December 06, 2019	Added the Frequency Band (LTE B2)



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1. GENERAL INFORMATION

1.1 Description of EUT

FCC ID	A3LSMR825	
Model Name	SM-R825F	
Product Name	Smart Watch	
Frequency Band	WCDMA FDD B5, LTE FDD B2/B5, Bluetooth, Wi-Fi 2.4 GHz, GNSS, NFC	
Power Supply	TA	Input: AC (100 ~ 240) V, (50 ~ 60) Hz, 0.5 A Output: DC 9.0 V, 1.67 A or DC 5.0 V, 2.0 A

1.2 Tested System Details

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

Device Type	Model Name	Serial Number	Manufacturer
EUT	SM-R825F	-	SAMSUNG
TA	EP-TA200	-	SOLUM
Wireless Pad	EP-OR825	-	SEV



1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	-	-	-	-
Wireless Pad	USB	Y	N/A	(P) 1.0

* 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	-	-	-	-	-
Wireless Pad	USB	N	N/A	Y	TA 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	KR0032
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #1	
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #2	

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 C63.5:2017

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)	1.8 dB
Radiated Emissions (30 MHz to 1 GHz)	4.8 dB
Radiated Emissions (1 GHz to 18 GHz)	5.4 dB
Radiated Emissions (18 GHz to 40 GHz)	5.7 dB



2. 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>					
☒ EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
☒ LISN	Rohde & Schwarz	ENV216	102245	1 year	09.11.2019
☐ LISN	Rohde & Schwarz	ENV216	100073	1 year	04.30.2019
☒ Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.20.2019
☒ Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒ Trilog Antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
☒ 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	-	N/A	-
☒ Turn Table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒ Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.20.2019
☒ Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-
-For measurement above 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒ 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	-	N/A	-
☒ Turn Table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.19.2019
☒ Low Noise Amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
☐ 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	08.20.2019
☒ Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-



3. DESCRIPTION OF TEST

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 ($\mu\text{V}/\text{m}$)	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

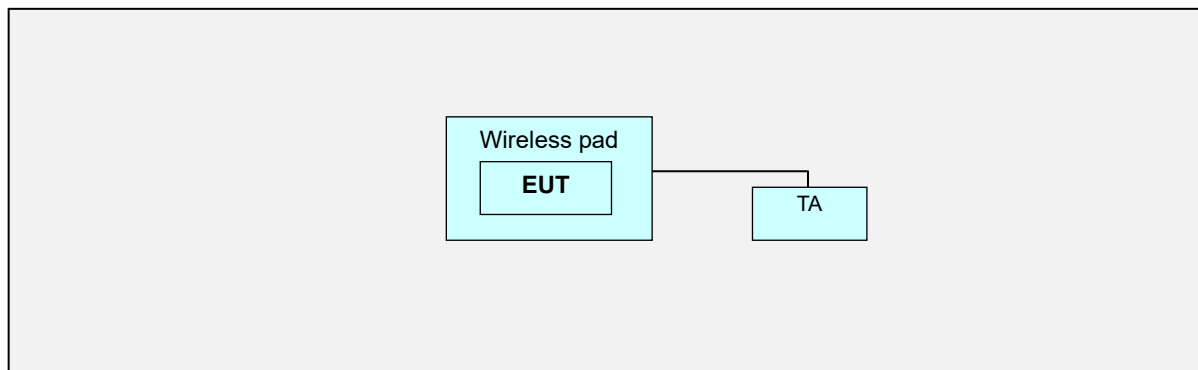


3.2.1 Frequency Range of Radiated Measurements

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 GHz, whichever is lower

3.3 Configuration of Tested System



Non-Conductive Table
Power Line: 120 VAC, 60 Hz



4. PRELIMINARY TEST

During preliminary tests, the following operating mode was investigated.

WCDMA 850 Idle (Low/Middle/High CH)

LTE B5 Idle (Low/Middle/High CH)

4.1 Conducted Emission

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

Operating Modes:

LTE B5 Idle (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:

LTE B5 Idle (Low/Middle/High CH)

NOTE.

1. Three orientations have been investigated and the worst case orientation (x-axis: The display of EUT placed on the table is facing upwards) is reported.
2. The worst case of operating mode is reported.



5. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

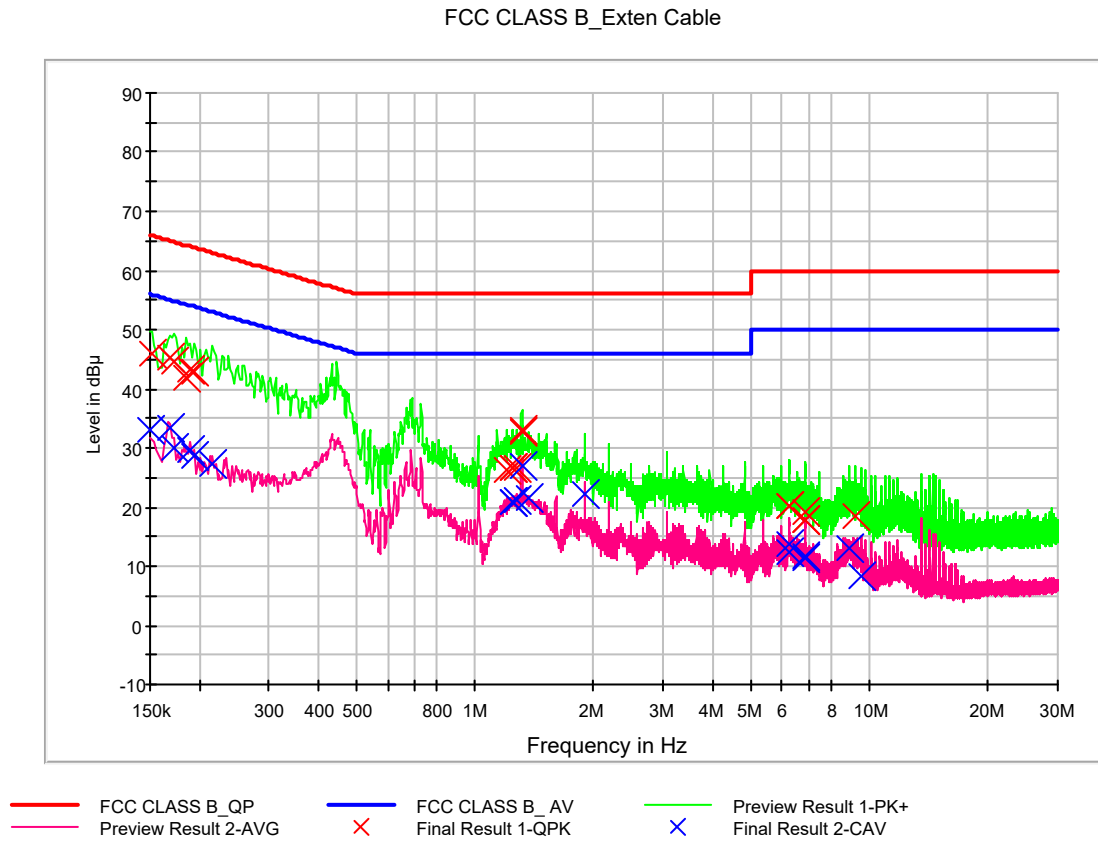
5.1 Conducted Emission

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

Rule Part / Standard	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	LTE B5 Idle (High CH)
Kind of Test Site	Shielded Room
Temperature	22.3 °C
Relative Humidity	41.9 %
Test Date	November 13, 2019

- 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, LTE B5 Idle (High CH), Line (L1)**



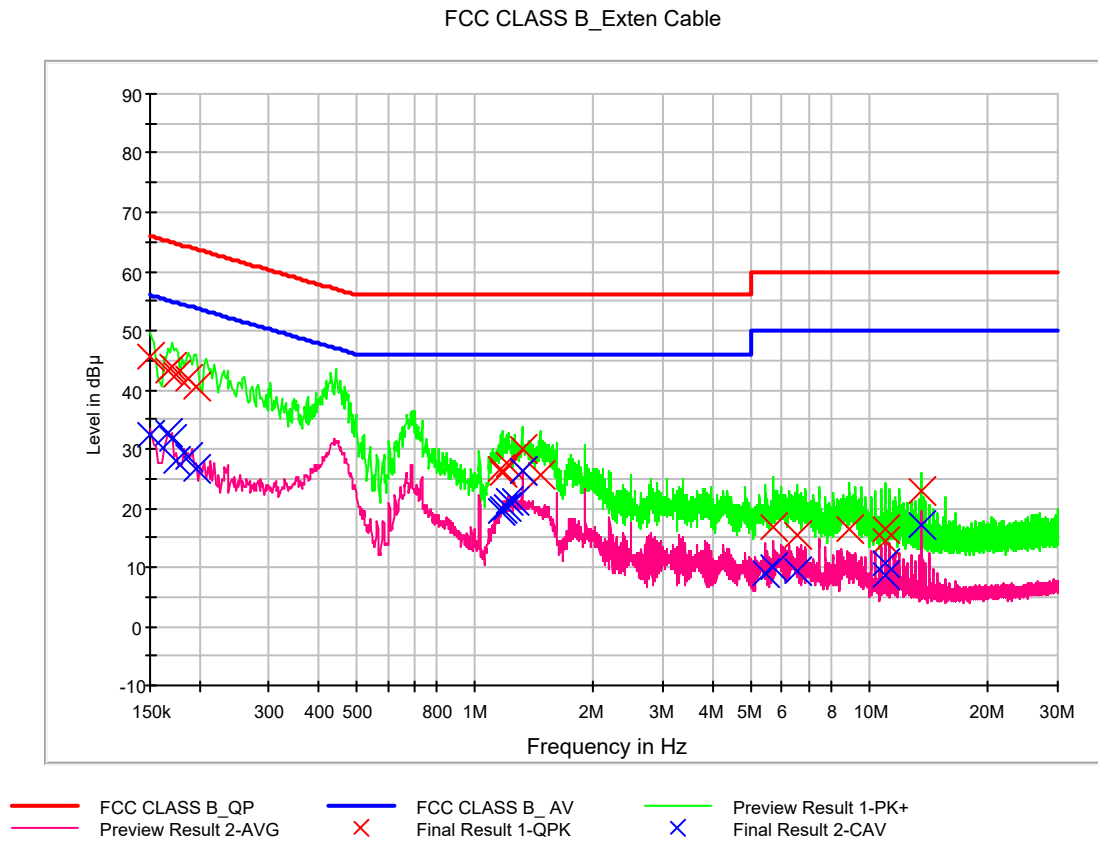
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	45.8	9.000	L1	9.8	20.1	65.9
0.168000	45.1	9.000	L1	9.8	20.0	65.1
0.172000	44.6	9.000	L1	9.8	20.2	64.9
0.186000	41.8	9.000	L1	9.8	22.4	64.2
0.190000	43.3	9.000	L1	9.8	20.8	64.0
0.194000	43.0	9.000	L1	9.8	20.9	63.9
1.206000	26.2	9.000	L1	9.9	29.8	56.0
1.244000	26.6	9.000	L1	9.9	29.4	56.0
1.248000	26.6	9.000	L1	9.9	29.4	56.0
1.274000	26.6	9.000	L1	9.9	29.4	56.0
1.314000	32.7	9.000	L1	9.9	23.3	56.0
1.318000	33.0	9.000	L1	9.9	23.0	56.0
6.266000	20.2	9.000	L1	10.1	39.8	60.0
6.272000	20.2	9.000	L1	10.1	39.8	60.0
6.860000	17.8	9.000	L1	10.2	42.2	60.0
6.866000	17.9	9.000	L1	10.2	42.1	60.0
6.870000	19.0	9.000	L1	10.2	41.0	60.0
9.192000	18.3	9.000	L1	10.3	41.7	60.0



CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	33.2	9.000	L1	9.8	22.8	56.0
0.168000	33.3	9.000	L1	9.8	21.8	55.1
0.172000	30.1	9.000	L1	9.8	24.7	54.9
0.190000	29.5	9.000	L1	9.8	24.5	54.0
0.194000	28.7	9.000	L1	9.8	25.2	53.9
0.216000	27.2	9.000	L1	9.8	25.8	53.0
1.244000	20.8	9.000	L1	9.9	25.2	46.0
1.248000	21.0	9.000	L1	9.9	25.0	46.0
1.274000	21.3	9.000	L1	9.9	24.7	46.0
1.314000	27.0	9.000	L1	9.9	19.0	46.0
1.368000	21.4	9.000	L1	9.9	24.6	46.0
1.898000	22.2	9.000	L1	9.9	23.8	46.0
6.266000	13.8	9.000	L1	10.1	36.2	50.0
6.274000	12.5	9.000	L1	10.1	37.5	50.0
6.860000	11.3	9.000	L1	10.2	38.7	50.0
6.864000	11.8	9.000	L1	10.2	38.2	50.0
8.900000	13.2	9.000	L1	10.3	36.8	50.0
9.490000	8.4	9.000	L1	10.3	41.6	50.0

**Figure 2: Conducted Emission, LTE B5 Idle (High CH), Line (N)**



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	45.6	9.000	N	9.8	20.4	66.0
0.166000	43.2	9.000	N	9.8	22.0	65.2
0.170000	43.9	9.000	N	9.8	21.1	65.0
0.174000	42.6	9.000	N	9.8	22.2	64.8
0.188000	41.9	9.000	N	9.8	22.3	64.1
0.196000	40.7	9.000	N	9.8	23.1	63.8
1.162000	26.6	9.000	N	9.9	29.4	56.0
1.170000	26.1	9.000	N	9.9	29.9	56.0
1.214000	27.2	9.000	N	9.9	28.8	56.0
1.314000	26.3	9.000	N	9.9	29.7	56.0
1.318000	30.1	9.000	N	9.9	25.9	56.0
1.460000	25.4	9.000	N	9.9	30.6	56.0
5.714000	16.6	9.000	N	10.1	43.4	60.0
6.586000	15.5	9.000	N	10.2	44.5	60.0
8.928000	16.6	9.000	N	10.3	43.4	60.0
10.980000	14.4	9.000	N	10.4	45.6	60.0
10.988000	16.3	9.000	N	10.4	43.7	60.0
13.560000	22.8	9.000	N	10.5	37.2	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	32.4	9.000	N	9.8	23.6	56.0
0.166000	32.8	9.000	N	9.8	22.3	55.2
0.170000	31.6	9.000	N	9.8	23.3	55.0
0.174000	28.1	9.000	N	9.8	26.7	54.8
0.188000	28.7	9.000	N	9.8	25.4	54.1
0.196000	26.7	9.000	N	9.8	27.1	53.8
1.162000	19.6	9.000	N	9.9	26.4	46.0
1.170000	19.8	9.000	N	9.9	26.2	46.0
1.208000	20.3	9.000	N	9.9	25.7	46.0
1.212000	21.3	9.000	N	9.9	24.7	46.0
1.258000	21.0	9.000	N	9.9	25.0	46.0
1.318000	26.1	9.000	N	9.9	19.9	46.0
5.416000	9.0	9.000	N	10.1	41.0	50.0
5.714000	9.9	9.000	N	10.1	40.1	50.0
6.586000	9.4	9.000	N	10.2	40.6	50.0
10.982000	8.7	9.000	N	10.4	41.3	50.0
10.988000	10.6	9.000	N	10.4	39.4	50.0
13.562000	17.1	9.000	N	10.5	32.9	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	LTE B5 Idle (High CH)
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.5 °C
Relative Humidity	41.2 %
Test Date	November 12, 2019

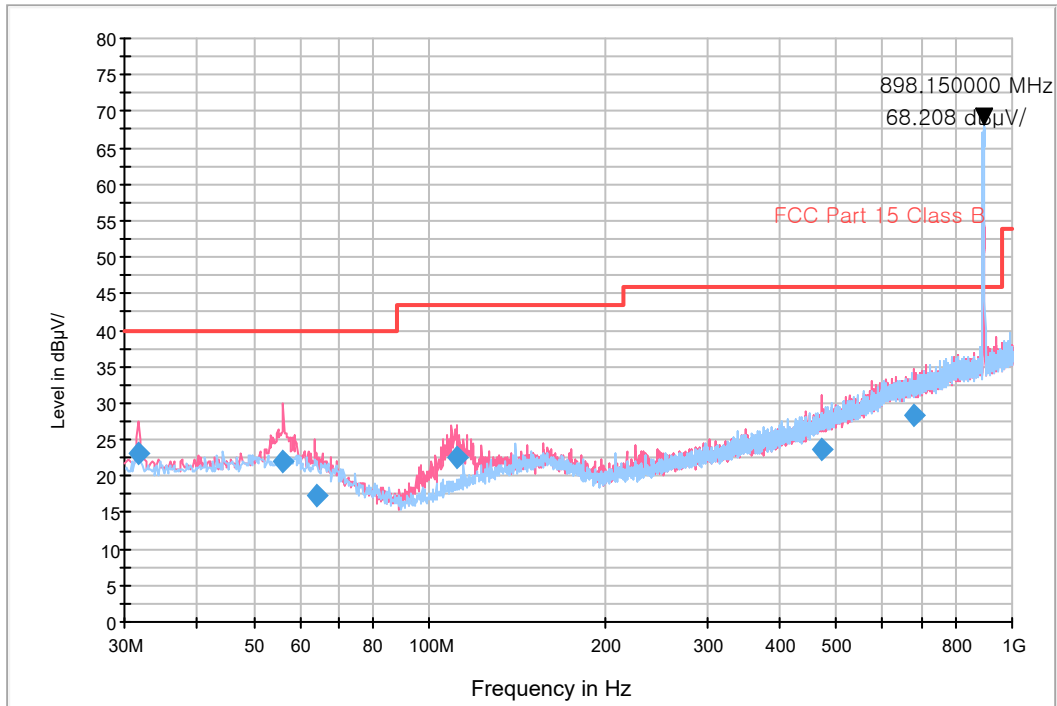
- Calculation Formula:

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



Figure 3: Radiated Emission, LTE B5 Idle (High CH)

FCC PART 15 CLASS B



NOTE. 1. LTE B5 High CH RX Frequency: 898.150 MHz
2. These are signals for fundamental frequency from the base station

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
31.762800	23.2	100.0	V	18.0	18.4	16.8	40.0
56.285200	22.1	100.0	V	254.0	19.6	17.9	40.0
64.204400	17.2	100.0	V	0.0	18.8	22.8	40.0
111.866200	22.5	100.0	V	45.0	16.5	21.0	43.5
470.931400	23.5	100.0	V	101.0	24.6	22.5	46.0
677.259200	28.4	174.8	V	192.0	28.5	17.6	46.0



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	2 480 MHz
Tested Frequency Range	1 GHz to 18 GHz
Worst Case of Operating Mode	LTE B5 Idle (High CH)
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.5 °C
Relative Humidity	41.2 %
Test Date	November 12, 2019

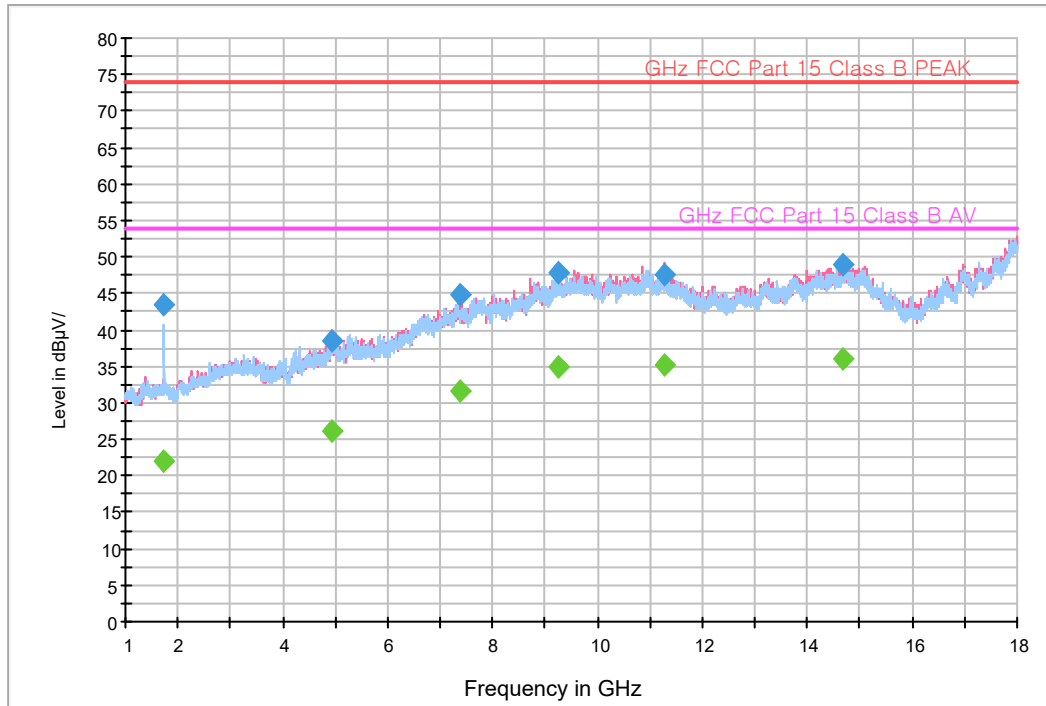
- Calculation Formula:

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



Figure 4: Radiated Emission, LTE B5 Idle (High CH)

Tilting of GHz FCC PART 15 CLASS B



Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1738.565000	43.6	205.6	H	184.0	-25.4	30.4	74.0
4928.550000	38.5	150.0	H	250.0	-16.0	35.5	74.0
7375.475000	44.7	150.0	V	136.0	-9.6	29.3	74.0
9254.630000	47.8	113.4	H	36.0	-5.8	26.2	74.0
11276.885000	47.5	198.4	V	112.0	-2.4	26.5	74.0
14685.855000	49.0	218.5	H	337.0	1.0	25.0	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1738.565000	22.0	205.6	H	184.0	-25.4	32.0	54.0
4928.550000	26.2	150.0	H	250.0	-16.0	27.8	54.0
7375.475000	31.6	150.0	V	136.0	-9.6	22.4	54.0
9254.630000	35.0	113.4	H	36.0	-5.8	19.0	54.0
11276.885000	35.1	198.4	V	112.0	-2.4	18.9	54.0
14685.855000	36.0	218.5	H	337.0	1.0	18.0	54.0



6. CONCLUSION

The data collected shows that the **EUT Type: Smart Watch, FCC ID: A3LSMR825, Model Name: SM-R825F** complies with §15.107 and §15.109 of the FCC rules.



7. APPENDIX A. TEST SETUP PHOTO

Please refer to EMI Test Setup Photo and test setup photo file no. as follows;

Rev. No.	Issue Date	File No.
0	November 13, 2019	HCT-EM-1911-FC001-P

End of report