

EMI TEST REPORT FCC CERTIFICATION / ISED

Applicant:

SAMSUNG Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 16677, Korea

Date of Issue: January 16, 2020

Test Report No. HCT-EM-2001-FI002

Test Site: HCT CO., LTD.

**FCC ID
IC**

**A3LSMR825
649E-SMR825**

Rule Part(s) / Standard(s) : 47 CFR PART 15 Subpart B Class B
ICES-003 Issue 6 Class B
ANSI C63.4-2014

Product Name : Smart Watch

Model Name : SM-R825U

Series Model Name : SM-R825F

Date of Test : January 07, 2020 to January 10, 2020

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

Tested By



Na-Eun Song
Test Engineer
EMC Team
Certification Division

Reviewed



Gu-Cheol Yoon
Technical Manager
EMC Team
Certification Division

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.



REVISION HISTORY

The revision history for this document is shown in table.

Revision No.	Issue Date	Information About Changes
0	January 16, 2020	Initial Release

This Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation), which signed the ILAC-MRA.

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.



TABLE OF CONTENTS

	PAGE
1. GENERAL INFORMATION	4
1.1 Description of EUT	4
1.2 Tested System Details	4
1.3 Cable Description	5
1.4 Noise Suppression Parts on Cable. (I/O Cable)	5
1.5 Test Facility	6
1.6 Calibration of Measuring Instrument	6
1.7 Measurement Uncertainty	6
2. LIST OF TEST EQUIPMENT	7
3. DESCRIPTION OF TEST	8
3.1 Measurement of Conducted Emission	8
3.2 Measurement of Radiated Emission	9
4. PRELIMINARY TEST	11
4.1 Conducted Emission	11
4.2 Radiated Emission	11
5. CONDUCTED AND RADIATED EMISSION TEST SUMMARY	12
5.1 Conducted Emission	12
5.2 Radiated Emission Below 1 GHz	13
5.3 Radiated Emission Above 1 GHz	15
6. CONCLUSION	17
7. APPENDIX A. TEST SETUP PHOTO	18



1. GENERAL INFORMATION

1.1 Description of EUT

FCC ID	A3LSMR825
IC	649E-SMR825
Model Name	SM-R825U
Series 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	Travel adaptor: Input: AC 100 to 240 V, 50 to 60 Hz, 0.5 A Output: DC 5.0 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-R825U	-	SAMSUNG
TA	EP-TA200	-	SOLU M
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	
Filing the EMI Measurement Facility (3 m Semi Anechoic Chamber and Shielded Room)	IC 5944A-4
Filing the EMI Measurement Facility (10 m Semi-Anechoic Chamber)	IC 5944A-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 (Not applicable)</u>					
<input type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
<input type="checkbox"/> LISN	Rohde & Schwarz	ENV216	102245	1 year	09.11.2019
<input type="checkbox"/> LISN	Rohde & Schwarz	ENV216	100073	1 year	04.30.2019
<input type="checkbox"/> Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.20.2019
<input type="checkbox"/> Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
<input type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
<input checked="" type="checkbox"/> Trilog Antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
<input checked="" type="checkbox"/> Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/> Turn Table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/> Turn Table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/> Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.20.2019
<input checked="" type="checkbox"/> Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32	-	-	-
-For measurement above 1 GHz					
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
<input checked="" type="checkbox"/> Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/> Turn Table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/> Turn Table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/> Horn Antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.19.2019
<input checked="" type="checkbox"/> Low Noise Amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
<input type="checkbox"/> Power Amplifier	TK-PA1840H	TESTEK	170033-L	1 year	03.11.2019
<input type="checkbox"/> Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170786	1 year	12.03.2019
<input checked="" type="checkbox"/> Radio communication analyzer	ANRITSU	MT8820C	6201138643	1 year	08.20.2019
<input checked="" type="checkbox"/> Antenna (for Communication)	Schwarzbeck	USLP9142	VSLP 9142-200	-	-
<input checked="" type="checkbox"/> 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

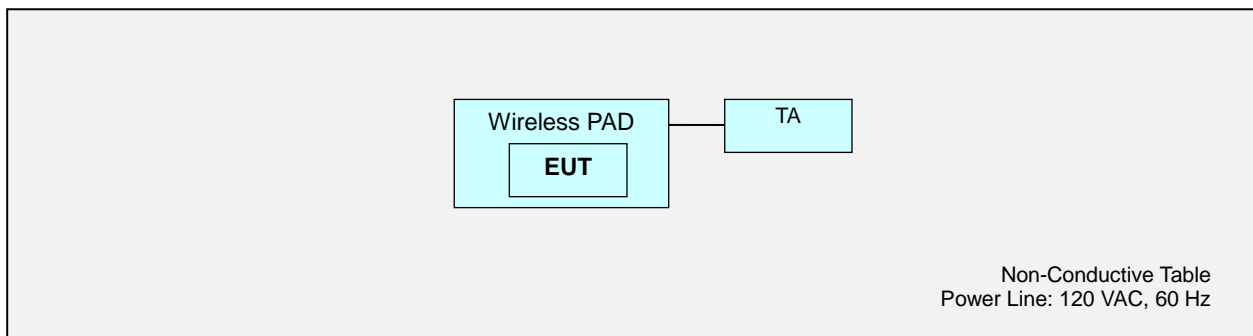


3.2.1 Frequency Range of Radiated Measurements

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





4. PRELIMINARY TEST

During preliminary tests, the following operating mode was investigated.

WCDMA 850 Idle mode (Low/Middle/High CH)
LTE B5 Idle mode (Low/Middle/High CH)

4.1 Conducted Emission

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

Operating Modes: Not applicable

4.2 Radiated Emission

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

Operating Modes:

LTE B5 Low CH Idle mode*
LTE B5 Middle CH Idle mode
LTE B5 High CH Idle mode

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 (Not Applicable)

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

Test Standard Used	FCC PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operating Mode	Not Applicable
Kind of Test Site	EMI Shielded Room
Temperature	- °C
Relative Humidity	- %
Test Date	-

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



5.2 Radiated Emission Below 1 GHz

The test results of radiated emission provide the following information:

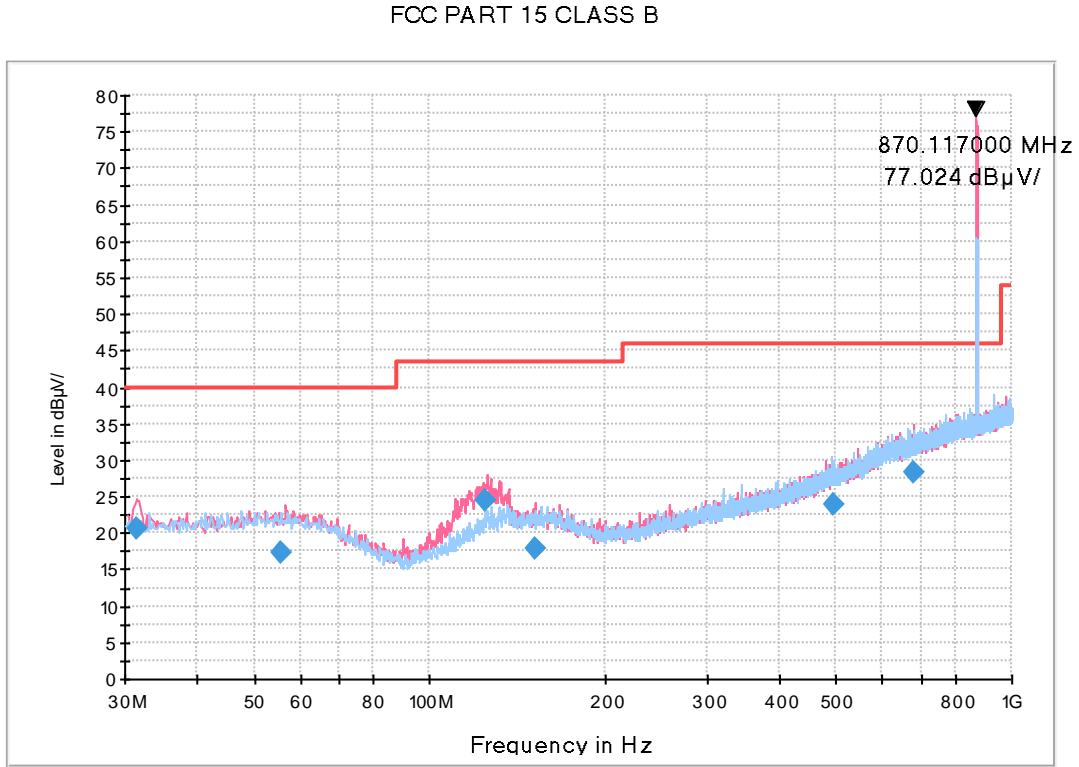
Test Standard Used	FCC PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Frequency Range	30 MHz to 1 000 MHz
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Worst Case of Operating Mode	LTE B5 Low CH Idle mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.1 °C
Relative Humidity	41.5 %
Test Date	January 07, 2020

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 1: LTE B5 Low CH Idle mode



NOTE. 1. Carrier Frequency: RX 870.117 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)
31.531600	20.6	100.0	V	218.0	18.4	19.4	40.0
55.668400	17.4	100.0	V	86.0	19.6	22.6	40.0
124.999600	24.5	100.0	V	208.0	17.8	19.0	43.5
151.640400	17.8	292.8	V	86.0	19.5	25.7	43.5
493.004400	24.0	100.0	H	272.0	25.1	22.0	46.0
678.754200	28.3	174.9	V	138.0	28.5	17.7	46.0



5.3 Radiated Emission Above 1 GHz

The test results of radiated emission provide the following information:

Test Standard Used	FCC PART 15 Subpart B Class B ICES-003 Issue 6 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 Low CH Idle mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.6 °C
Relative Humidity	41.4 %
Test Date	January 10, 2020

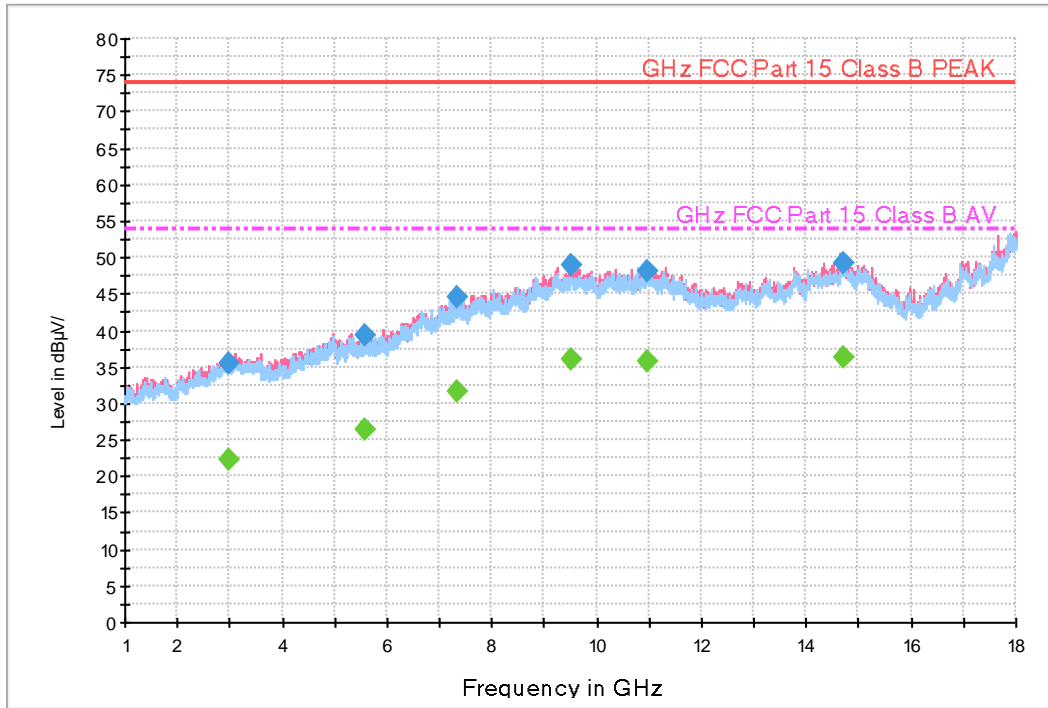
Calculation Formula:

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 2: LTE B5 Low CH Idle Mode

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)
2968.670000	35.5	113.4	V	50.0	-21.2	38.5	74.0
5584.850000	39.4	400.0	H	318.0	-15.1	34.6	74.0
7352.660000	44.6	249.9	V	141.0	-9.7	29.4	74.0
9524.340000	49.0	278.5	V	296.0	-5.1	25.0	74.0
10986.755000	48.2	176.5	V	240.0	-2.4	25.8	74.0
14721.735000	49.2	248.7	H	210.0	1.0	24.8	74.0

Frequency (MHz)	CAverage (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2968.670000	22.3	113.4	V	50.0	-21.2	31.7	54.0
5584.850000	26.5	400.0	H	318.0	-15.1	27.5	54.0
7352.660000	31.6	249.9	V	141.0	-9.7	22.4	54.0
9524.340000	36.1	278.5	V	296.0	-5.1	17.9	54.0
10986.755000	35.7	176.5	V	240.0	-2.4	18.3	54.0
14721.735000	36.2	248.7	H	210.0	1.0	17.8	54.0



6. CONCLUSION

The data collected shows that the **EUT Type: Smart Watch, Model Name: SM-R825U** complies with §15.107 and §15.109 of the FCC rules and ICES-003 Issue 6 of the IC 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	January 16, 2020	HCT-EM-2001-FI002-P

End of report