

EMI TEST REPORT

FCC CERTIFICATION

Applicant:

SAMSUNG Electronics Co., Ltd.

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,
16677, Korea

Date of Receipt: July 13, 2017

Date of Issue: July 27, 2017

Test Report No. HCT-E-1707-F036

HCT FRN: 0005866421

FCC ID :

A3LSMR140R

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: Bluetooth Headset
Model Name: SM-R140
Date of Test: July 21, 2017 – July 26, 2017

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



Wook Yi
Test Engineer
EMC Team
Certification Division

Reviewed By



Jin-Pyo Hong
Technical Manager
EMC Team
Certification Division

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REVISION HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1707-F036	July 27, 2017	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.

FCC ID	A3LSMR140R
Model	SM-R140
EUT Type	Bluetooth Headset
Frequency	2 402 MHz to 2 480 MHz (Bluetooth) TX/RX

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, SOUTH KOREA. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014.

Measurement Facilities	Registration Number
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	90661 (July 07, 2015)
Radiated Field strength measurement facility 10 m Semi Anechoic chamber	

1.4 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 equipments, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).



1.5 Tested System Details

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

Device Type	Model Name	Serial Number	Manufacturer	FCC ID / DoC
EUT	SM-R140	-	SAMSUNG	A3LSMR140R
Cradle	EB-PR140	-	SAMSUNG	-
Battery	CP1454A3	-	VARTA	-
Data cable	EP-DN930CWE	-	CRESYN	-
Notebook PC	ProBook6560b	5CB2053MXF	HP	-
Notebook PC adaptor	PPP009D	WBGSV0BDD 1VLC	Delta Electronics	-
Gateway	TL-WR747N	-	TP Link	-
Gateway adaptor	T120150-2H1	-	TP Link	-
Serial mouse	Serial 2 Button mouse	02031069	Radio Shack	FSUGMZE3



1.6 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	5 PIN	N	N/A	-
Cradle	USB C type	Y	Y	(P, D) 1.2
Gateway	DC IN	N	N/A	(P) 1.5
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

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

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

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	5 PIN	N	N/A	N	N/A
Cradle	USB C type	N	N/A	Y	Both end
Gateway	DC IN	N	N/A	Y	Gateway end
Notebook PC	RJ 45	Y	Both end	N	N/A
	Serial(Mouse)	N	N/A	N	N/A
	DC IN	N	N/A	Y	Notebook end



2. 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 ($k = 2$)
Radiated Emissions (30 MHz to 1 GHz)	5.20 dB ($k = 2$)
Radiated Emissions (1 GHz to 18 GHz)	5.24 dB ($k = 2$)
Radiated Emissions (18 GHz to 40 GHz)	5.40 dB ($k = 2$)



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

- 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.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- 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.
- 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.
- 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

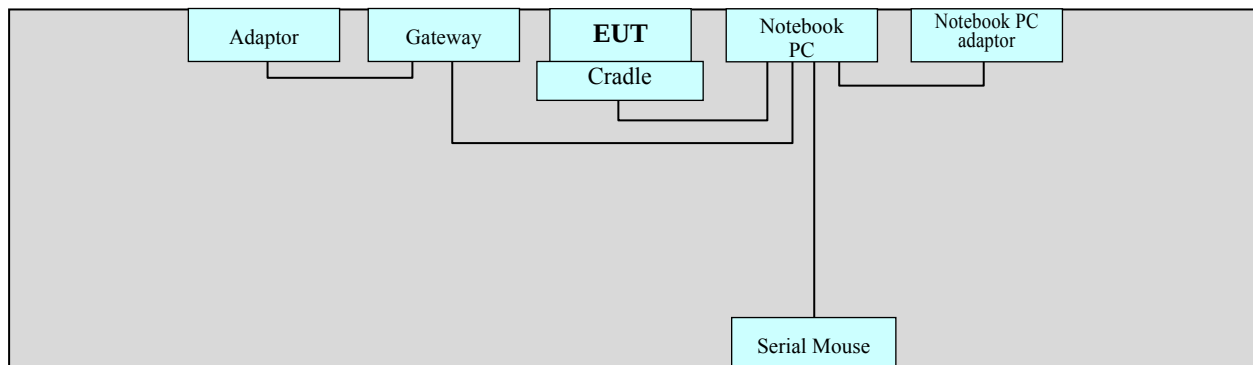


3.2.1 Frequency Range of Radiated Measurements

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

4.1 Conducted Emission Test

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

Operation Mode: Charging & DATA Mode (RIGHT)

4. 2 Radiated Emission Test

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

Operation Mode: Charging & DATA Mode (RIGHT)



5. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

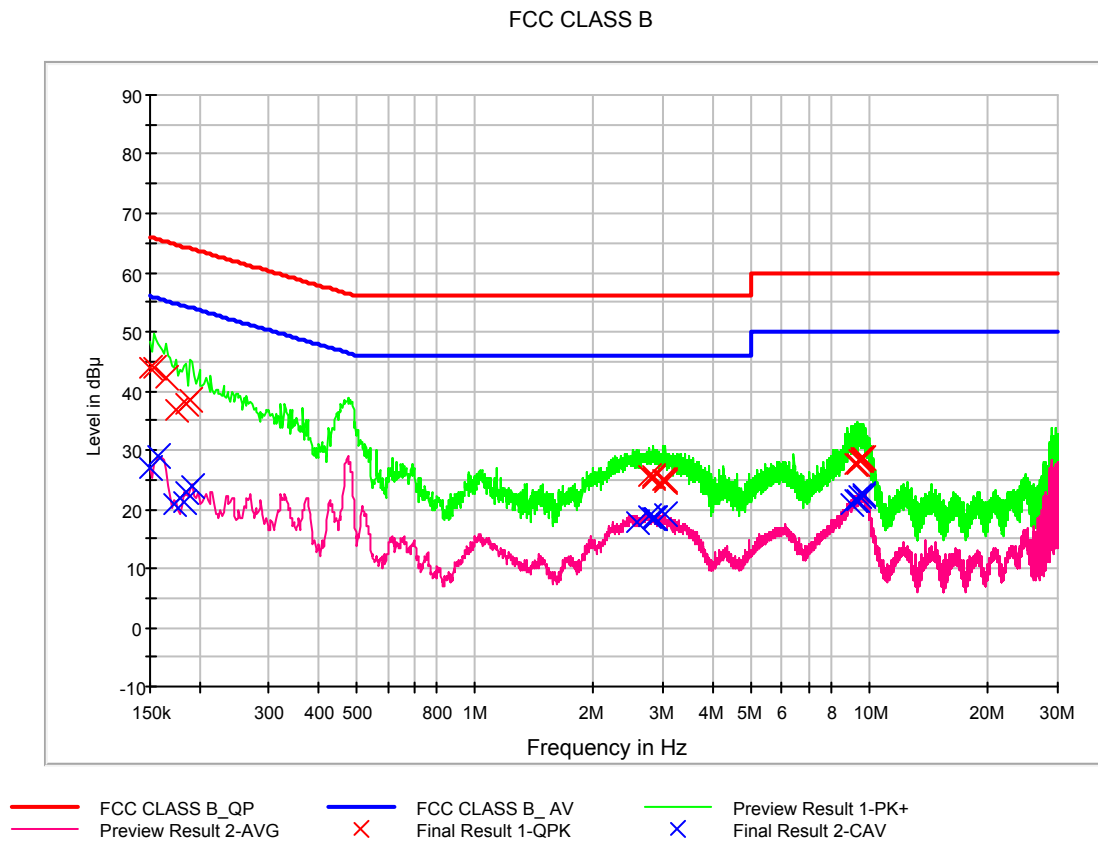
5.1 Conducted Emission Test

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	24.2 °C
Relative Humidity	53.4 %
Test Date	July 25, 2017

- 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, AC Main Port, Line (L1)**



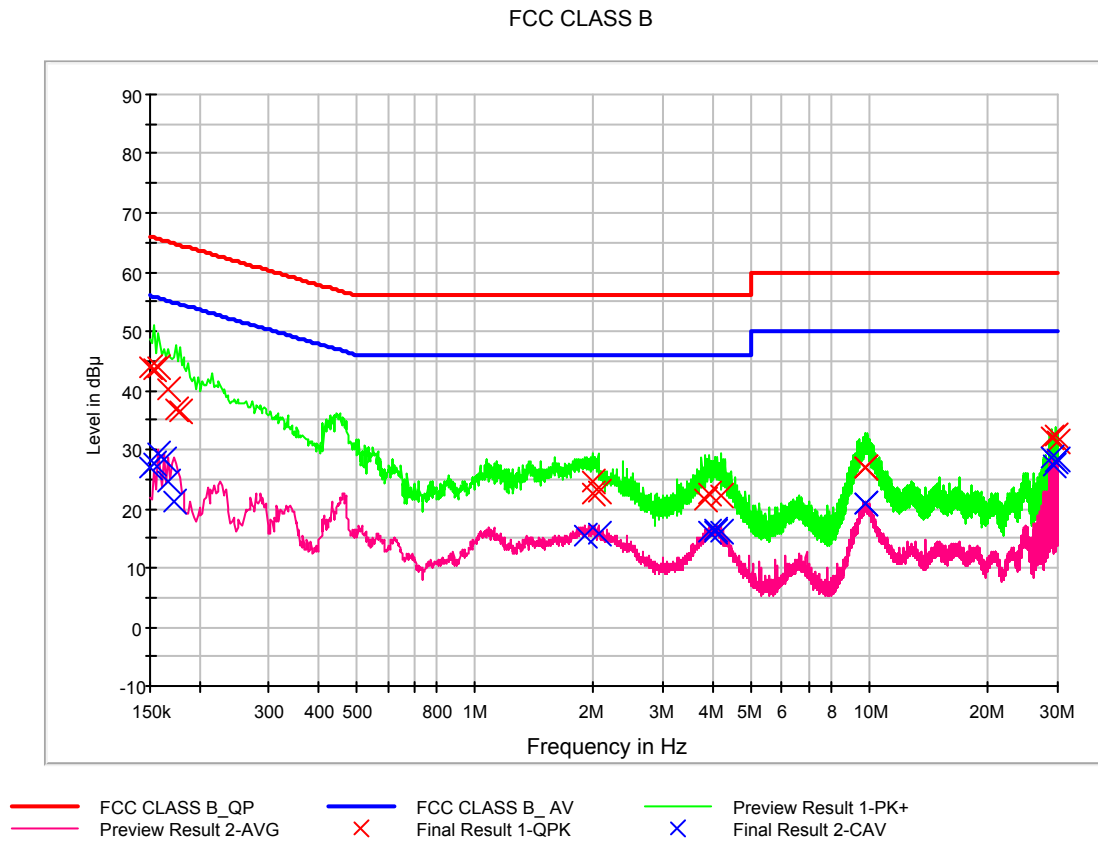
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	43.9	9.000	L1	9.6	22.1	66.0
0.154000	43.8	9.000	L1	9.6	22.0	65.8
0.164000	42.3	9.000	L1	9.6	23.0	65.3
0.174000	36.8	9.000	L1	9.6	28.0	64.8
0.186000	38.0	9.000	L1	9.6	26.2	64.2
0.190000	38.5	9.000	L1	9.6	25.5	64.0
2.758000	25.8	9.000	L1	9.8	30.2	56.0
2.812000	25.4	9.000	L1	9.8	30.6	56.0
2.826000	25.3	9.000	L1	9.8	30.7	56.0
3.004000	24.8	9.000	L1	9.8	31.2	56.0
3.032000	24.8	9.000	L1	9.8	31.2	56.0
3.040000	24.7	9.000	L1	9.8	31.3	56.0
9.166000	27.8	9.000	L1	10.1	32.2	60.0
9.274000	27.7	9.000	L1	10.1	32.3	60.0
9.378000	28.4	9.000	L1	10.1	31.6	60.0
9.488000	28.4	9.000	L1	10.1	31.6	60.0
9.496000	28.5	9.000	L1	10.1	31.5	60.0
9.666000	28.7	9.000	L1	10.1	31.3	60.0



CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	26.9	9.000	L1	9.6	29.1	56.0
0.158000	29.1	9.000	L1	9.6	26.5	55.6
0.172000	21.0	9.000	L1	9.6	33.9	54.9
0.182000	21.1	9.000	L1	9.6	33.3	54.4
0.186000	23.0	9.000	L1	9.6	31.2	54.2
0.192000	23.7	9.000	L1	9.6	30.2	53.9
2.564000	17.9	9.000	L1	9.8	28.1	46.0
2.764000	18.9	9.000	L1	9.8	27.1	46.0
2.810000	18.6	9.000	L1	9.8	27.4	46.0
2.850000	18.4	9.000	L1	9.8	27.6	46.0
2.866000	18.3	9.000	L1	9.8	27.7	46.0
3.048000	19.1	9.000	L1	9.8	26.9	46.0
8.950000	20.7	9.000	L1	10.1	29.3	50.0
9.166000	21.6	9.000	L1	10.1	28.4	50.0
9.274000	21.5	9.000	L1	10.1	28.5	50.0
9.378000	22.2	9.000	L1	10.1	27.8	50.0
9.640000	22.3	9.000	L1	10.1	27.7	50.0
9.666000	22.6	9.000	L1	10.1	27.4	50.0

**Figure 2: Conducted Emission, AC Main Port, Line (N)**



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	43.9	9.000	N	9.6	22.1	66.0
0.154000	43.6	9.000	N	9.6	22.1	65.8
0.158000	43.9	9.000	N	9.6	21.7	65.6
0.166000	40.3	9.000	N	9.6	24.8	65.2
0.174000	36.6	9.000	N	9.6	28.1	64.8
0.178000	36.4	9.000	N	9.6	28.2	64.6
1.992000	22.5	9.000	N	9.7	33.5	56.0
1.998000	24.4	9.000	N	9.7	31.6	56.0
2.050000	22.7	9.000	N	9.8	33.3	56.0
3.824000	21.7	9.000	N	9.8	34.3	56.0
3.904000	22.6	9.000	N	9.8	33.4	56.0
4.186000	22.2	9.000	N	9.8	33.8	56.0
9.712000	27.0	9.000	N	10.1	33.0	60.0
9.724000	26.9	9.000	N	10.1	33.1	60.0
9.750000	26.9	9.000	N	10.1	33.1	60.0
29.082000	31.9	9.000	N	10.4	28.1	60.0
29.736000	32.3	9.000	N	10.4	27.7	60.0
29.970000	31.5	9.000	N	10.4	28.5	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	27.0	9.000	N	9.6	29.0	56.0
0.154000	27.7	9.000	N	9.6	28.1	55.8
0.158000	29.3	9.000	N	9.6	26.3	55.6
0.162000	28.4	9.000	N	9.6	27.0	55.4
0.166000	24.6	9.000	N	9.6	30.5	55.2
0.172000	21.2	9.000	N	9.6	33.7	54.9
1.896000	15.5	9.000	N	9.7	30.5	46.0
2.050000	15.8	9.000	N	9.8	30.2	46.0
3.904000	16.1	9.000	N	9.8	29.9	46.0
4.046000	16.1	9.000	N	9.8	29.9	46.0
4.078000	16.4	9.000	N	9.8	29.6	46.0
4.186000	15.9	9.000	N	9.8	30.1	46.0
9.712000	20.7	9.000	N	10.1	29.3	50.0
9.724000	20.8	9.000	N	10.1	29.2	50.0
29.082000	28.5	9.000	N	10.4	21.5	50.0
29.364000	27.3	9.000	N	10.4	22.7	50.0
29.736000	28.1	9.000	N	10.4	21.9	50.0
29.970000	28.3	9.000	N	10.4	21.7	50.0



5.2 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	23.2 °C
Relative Humidity	52.7 %
Test Date	July 26, 2017

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.600288	29.8	229.0	V	2.0	21.8	10.2	40.0
47.799200	31.4	100.0	V	113.0	23.2	8.6	40.0
66.291200	28.6	100.0	V	311.0	21.8	11.4	40.0
125.008000	30.5	100.0	V	252.0	21.5	13.0	43.5
265.580800	35.0	100.0	H	118.0	22.8	11.0	46.0
500.004800	38.5	100.0	H	2.0	28.9	7.5	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: 3 MHz)
Highest Operating Frequency	2.48 GHz
Upper Frequency of Measurement Range	1 GHz to 12.4 GHz
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.2 °C
Relative Humidity	51.1 %
Test Date	July 21, 2017

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1399.895000	48.1	400.0	H	314.0	-12.9	25.9	74.0
2054.475000	46.5	111.5	V	26.0	-11.6	27.5	74.0
2659.530000	47.9	400.0	V	23.0	-9.4	26.1	74.0
3360.185000	38.3	99.9	V	96.0	-8.5	35.7	74.0
7391.105000	46.6	149.9	H	184.0	3.2	27.4	74.0
9807.380000	48.4	99.9	V	96.0	7.3	25.6	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1399.895000	46.1	400.0	H	314.0	-12.9	7.9	54.0
2054.475000	23.4	111.5	V	26.0	-11.6	30.6	54.0
2659.530000	24.2	400.0	V	23.0	-9.4	29.8	54.0
3360.185000	24.0	99.9	V	96.0	-8.5	30.0	54.0
7391.105000	32.7	149.9	H	184.0	3.2	21.3	54.0
9807.380000	35.8	99.9	V	96.0	7.3	18.2	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. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	CAL Date
<u>Conducted Emission</u>					
☒ EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	12.23.2016
☒ LISN	Rohde & Schwarz	ENV216	100073	1 year	12.23.2016
☒ LISN	Rohde & Schwarz	ESH3-Z5	100282	1 year	05.22.2017
☒ Software	Rohde & Schwarz	EMC32 VER 8.54.0	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
☐ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	11.04.2016
☒ EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	04.05.2017
☒ Trilog Antenna	Schwarzbeck	VULB9168	760	2 year	04.06.2017
☒ Antenna master	HD GmbH	MA240	240/520	N/A	-
☐ Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
☒ Turn Table	EMCO	1060-2M	-	N/A	-
☐ Turn Table controller	EMCO	2090	9702-1224	N/A	-
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	05.16.2017
☐ Antenna master	INNCO Systems	MA4000-EP	MA4000/283	N/A	-
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32 VER 8.40.0	-	-	-
-For measurement above 1 GHz					
☐ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	11.04.2016
☒ EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	04.05.2017
☐ Antenna master	HD GmbH	MA240	240/520	N/A	-
☐ Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
☒ Antenna master	INNCO Systems	MA4000-XP-ET	48709515	N/A	-
☒ Antenna master controller	INNCO Systems	CO 3000	CO 3000/870/ 35990515/L	N/A	-
☒ Turn Table	EMCO	1060-2M	-	N/A	-
☒ Power Amplifier	CERNEX	CBLU5183530	24348	1 year	06.01.2017
☒ Turn Table controller	EMCO	2090	9702-1224	N/A	-
☐ Power Amplifier	CERNEX	CBLU1183540	21691	1 year	06.28.2017
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	10.12.2016
☐ Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170541	2 year	09.03.2015
☐ Power Amplifier	CERNEX	CBL18265035	21873	1 year	01.19.2017
☐ Power Amplifier	CERNEX	CBL26405040	19660	1 year	07.11.2017
☐ Horn Antenna	Schwarzbeck	BBHA 9120D	1300	2 year	08.25.2016
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	05.16.2017
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32 VER 8.40.0	-	-	-



7. CONCLUSION

The data collected shows that the **EUT Type: Bluetooth Headset Model: SM-R140, FCC ID: A3LSMR140R** complies with §15.107 and §15.109 of the FCC rules.