



# TEST REPORT

|                                                                                                                                                                                           |                                                          |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--|
| <b>KCTL Inc.</b><br>65, Sinwon-ro, Yeongtong-gu,<br>Suwon-si, Gyeonggi-do, 16677, Korea<br>TEL: 82-31-285-0894 FAX: 82-505-299-8311<br><a href="http://www.kctl.co.kr">www.kctl.co.kr</a> | Report No.:<br><b>KR20-SRF0009-B</b><br>Page (1) of (12) |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--|

**1. Client**

◦ Name : Samsung Electronics Co., Ltd.

◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

◦ Date of Receipt : 2019-12-09

**2. Use of Report** : -

**3. Name of Product and Model** : Sound bar / HW-T450

**4. Manufacturer and Country of Origin** : Samsung Electronics Co., Ltd. / China

**5. FCC ID** : A3LHWT450

**6. IC Certificate No.** : 649E-HWT450

**7. Date of Test** : 2019-12-20 to 2020-01-06

**8. Test Standards** : 47 CFR Part 1.1310  
RSS-102 Issue 5 Mar. 2015

**9. Test Results** : Refer to the test result in the test report

|             |                                                                                                            |                                                                                                                       |
|-------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Affirmation | Tested by<br><div style="text-align: center;"> <br/>           Name : Heesu Ahn (Signature)         </div> | Technical Manager<br><div style="text-align: center;"> <br/>           Name : Jaehyong Lee (Signature)         </div> |
|-------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|

2020-01-22

## KCTL Inc.

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#### Report revision history

| Date       | Revision                  | Page No |
|------------|---------------------------|---------|
| 2020-01-15 | Initial report            | -       |
| 2020-01-17 | Updated                   | 4,10,11 |
| 2020-01-22 | Added factory information | 4       |
|            |                           |         |
|            |                           |         |
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**CONTENTS**

1. General information .....4

2. Device information .....4

    2.1. Accessory information .....4

    2.2. Information about derivative model.....5

    2.3. Frequency/channel operations.....5

3. Measurement uncertainty .....5

4. RF Exposure.....6

    4.1. Test results.....9

5. Measurement Equipment.....12



## 1. General information

Client : Samsung Electronics Co., Ltd.  
 Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea  
 Manufacturer : Samsung Electronics Co., Ltd.  
 Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea  
 Factory : TCLTechnoly Electronics (Huizhou) Co., Ltd. Zhongkai The Third Factory  
 Address : NO.88, North Of Luen Fat Road, Tongqiao Industrial Base, Zhongkai High-techDevelopment Zone, Huizhou City, Guangdong Province, P.R.China  
 Laboratory : KCTL Inc.  
 Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
 Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132  
 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056  
 Industry Canada Registration No. : 8035A  
 KOLAS No.: KT231

## 2. Device information

Equipment under test : Sound bar  
 Model : HW-T450  
 Derivative model : HW-T460, HW-T430, HW-T440, HW-T470, HW-T40M, HW-T47M  
 Frequency range : 2 402 MHz ~ 2 480 MHz : Bluetooth(BDR/EDR)  
 Modulation technique : Bluetooth(BDR/EDR)\_GFSK,  $\pi/4$ DQPSK, 8DPSK  
 Number of channels : Bluetooth(BDR/EDR)\_79 ch  
 Power source : AC 120 V  
 Antenna specification : PCB Antenna\_Bluetooth(BDR/EDR)  
 Antenna gain : 2.10 dBi\_Bluetooth(BDR/EDR)  
 Software version : 13  
 Hardware version : D  
 Test device serial No. : N/A  
 Operation temperature : -20 °C ~ 70 °C

### Notes:

This EUT contains certified SRD modular transmitter

- FCC ID : A3LWSM520V
- IC : 649E-WSM520V

### 2.1. Accessory information

| Equipment         | Manufacturer                 | Model       | Serial No. | Power source |
|-------------------|------------------------------|-------------|------------|--------------|
| Woofer            | Samsung Electronics Co.,Ltd. | PS-WT45T    | -          | AC 120 V     |
| Remote Controller | Samsung Electronics Co.,Ltd. | AH59-02767A | -          | DC 1.5 V     |

## 2.2. Information about derivative model

The difference between basic model and derivative models is:

The derivative models are according to buyer code.

## 2.3. Frequency/channel operations

This device contains the following capabilities:

Bluetooth(BDR/EDR)

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 00  | 2 402           |
| ⋮   | ⋮               |
| 39  | 2 441           |
| ⋮   | ⋮               |
| 78  | 2 480           |

Table 2.3.1. Bluetooth(BDR/EDR) mode

## 3. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k=2$  to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

| Parameter          | Expanded uncertainty ( $\pm$ ) |
|--------------------|--------------------------------|
| Conducted RF power | 1.76 dB                        |

## 4. RF Exposure

### FCC

#### Regulation

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC rules and Regulations.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Table 1 – Limits for Maximum Permissible Exposure (MPE)

| Frequency Range<br>(MHz)                                  | Electric Field<br>Strength<br>[V/m] | Magnetic Field<br>Strength<br>[A/m] | Power Density<br>[mW/cm <sup>2</sup> ] | Averaging<br>Time<br>[minute] |
|-----------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|-------------------------------|
| (A) Limits for Occupational / Controlled Exposure         |                                     |                                     |                                        |                               |
| 0.3 ~ 3.0                                                 | 614                                 | 1.63                                | *100                                   | 6                             |
| 3.0 ~ 30                                                  | 1842/f                              | 4.89/f                              | *900/f <sup>2</sup>                    | 6                             |
| 30 ~ 300                                                  | 61.4                                | 0.163                               | 1.0                                    | 6                             |
| 300 ~ 1 500                                               | /                                   | /                                   | f/300                                  | 6                             |
| 1 500 ~ 15 000                                            | /                                   | /                                   | 5                                      | 6                             |
| (B) Limits for General Population / Uncontrolled Exposure |                                     |                                     |                                        |                               |
| 0.3 ~ 1.34                                                | 614                                 | 1.63                                | *100                                   | 30                            |
| 1.34 ~ 30                                                 | 824/f                               | 2.19/f                              | *180/f <sup>2</sup>                    | 30                            |
| 30 ~ 300                                                  | 27.5                                | 0.073                               | 0.2                                    | 30                            |
| 300 ~ 1 500                                               | /                                   | /                                   | f/1 500                                | 30                            |
| 1 500 ~ 15 000                                            | /                                   | /                                   | 1.0                                    | 30                            |

*f*=frequency in MHz, \* = plane-wave equivalent power density

Per the guidance of KDB 680106, the E-field and H-field limits shown in the table above are extended down to 100 kHz

## IC

### RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

According to RSS-102 Issue 5, Paragraph "4. Exposure Limits", Industry of Canada has adopted the RF field strength limits established in Health Canada's RF exposure guideline, Safety code 6:

| Frequency Range<br>(MHz)                                                                                                  | Electric Field<br>(V/m rms)          | Magnetic Field<br>(A/m rms)             | Power Density<br>(W/m <sup>2</sup> )   | Reference Period<br>(minutes) |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------|----------------------------------------|-------------------------------|
| 0.003-10 <sup>21</sup>                                                                                                    | 83                                   | 90                                      | -                                      | Instantaneous*                |
| 0.1-10                                                                                                                    | -                                    | 0.73/ $f$                               | -                                      | 6**                           |
| 1.1-10                                                                                                                    | 87/ $f^{0.5}$                        | -                                       | -                                      | 6**                           |
| 10-20                                                                                                                     | 27.46                                | 0.0728                                  | 2                                      | 6                             |
| 20-48                                                                                                                     | 58.07/ $f^{0.25}$                    | 0.1540/ $f^{0.25}$                      | 8.944/ $f^{0.5}$                       | 6                             |
| 48-300                                                                                                                    | 22.06                                | 0.05852                                 | 1.291                                  | 6                             |
| <u>300-6000</u>                                                                                                           | <u>3.142 <math>f^{0.3417}</math></u> | <u>0.008335 <math>f^{0.3417}</math></u> | <u>0.02619 <math>f^{0.6834}</math></u> | <u>6</u>                      |
| 6000-15000                                                                                                                | 61.4                                 | 0.163                                   | 10                                     | 6                             |
| 15000-150000                                                                                                              | 61.4                                 | 0.163                                   | 10                                     | 616000/ $f^{1.2}$             |
| 150000-300000                                                                                                             | 0.158 $f^{0.5}$                      | 4.21 x 10 <sup>-4</sup> $f^{0.5}$       | 6.67 x 10 <sup>-5</sup> $f$            | 616000/ $f^{1.2}$             |
| <b>Note:</b> $f$ is frequency in MHz.<br>*Based on nerve stimulation (NS).<br>** Based on specific absorption rate (SAR). |                                      |                                         |                                        |                               |

### **Exemption Limits for Routine Evaluation – RF Exposure Evaluation**

According to RSS-102 Issue 5 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- Below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1W (adjusted for tune-up tolerance);
- At or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- At or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- At or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance.)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

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## 4.1. Test results

### FCC

#### **MPE (Maximum Permissible Exposure) Prediction**

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad (\Rightarrow R = \sqrt{PG/4\pi S})$$

S = power density [ $\text{mW}/\text{cm}^2$ ]

P = Power input to antenna [ $\text{mW}$ ]

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna [ $\text{cm}$ ]

### IC

#### **RF Exposure evaluation**

At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834} \text{ W}$  (adjusted for tune-up tolerance), where  $f$  is in MHz;

#### **RF Exposure Compliance Issue**

The information should be included in the user's manual:

This appliance and its antenna must not be co-located or operation is conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

### Calculation Result of RF exposure (FCC)

Maximum tune-up tolerance

#### - Bluetooth

| Mode | Frequency [MHz] | Max Tune-up Power [dBm] | Max Tune-up Power [mW] | Ant Gain [dBi] | Ant Gain [mW] | Power density at 20 cm [mW/cm <sup>2</sup> ] | Limit [mW/cm <sup>2</sup> ] |
|------|-----------------|-------------------------|------------------------|----------------|---------------|----------------------------------------------|-----------------------------|
| GFSK | 2 441           | 7.00                    | 5.01                   | 2.10           | 1.62          | 0.001 62                                     | 1.00                        |

#### - SRD

| Mode          | Frequency [MHz] | Max Tune-up Power [dBm] | Max Tune-up Power [mW] | Ant Gain [dBi] | Ant Gain [mW] | Power density at 20 cm [mW/cm <sup>2</sup> ] | Limit [mW/cm <sup>2</sup> ] |
|---------------|-----------------|-------------------------|------------------------|----------------|---------------|----------------------------------------------|-----------------------------|
| $\pi/4$ DQPSK | 5 730.35        | 9.50                    | 8.91                   | 2.20           | 1.66          | 0.002 94                                     | 1.00                        |

#### - Simultaneous Transmission

| Mode                                                   | Frequency [MHz] | Max Tune-up Power [dBm] | Max Tune-up Power [mW] | Ant Gain [dBi] | Ant Gain [mW] | Power density at 20 cm [mW/cm <sup>2</sup> ] | Limit [mW/cm <sup>2</sup> ] |
|--------------------------------------------------------|-----------------|-------------------------|------------------------|----------------|---------------|----------------------------------------------|-----------------------------|
| BT_GFSK(2 441 MHz) + SRD_ $\pi/4$ DQPSK (5 730.35 MHz) |                 |                         |                        |                |               | 0.004 56                                     | 1.00                        |

#### Note.

- The power density  $P_d$  (5th column) at a distance of 20 cm calculated from the friis transmission Formula is far below the limit of 1 mW/cm<sup>2</sup>.

### Calculation Results of RF exposure (IC)

#### - Bluetooth

| Mode | Frequency<br>[MHz] | Max Tune-<br>up Power<br>[dBm] | Ant<br>Gain<br>[dBi] | E.I.R.P |      | Limit<br>[mW] | Ratio   |
|------|--------------------|--------------------------------|----------------------|---------|------|---------------|---------|
|      |                    |                                |                      | [dBm]   | [mW] |               |         |
| GFSK | 2 441              | 7.00                           | 2.10                 | 9.10    | 8.13 | 2 706.05      | 0.003 0 |

#### - SRD

| Mode          | Frequency<br>[MHz] | Max Tune-<br>up Power<br>[dBm] | Ant<br>Gain<br>[dBi] | E.I.R.P |       | Limit<br>[mW] | Ratio   |
|---------------|--------------------|--------------------------------|----------------------|---------|-------|---------------|---------|
|               |                    |                                |                      | [dBm]   | [mW]  |               |         |
| $\pi/4$ DQPSK | 5 730.35           | 9.50                           | 2.20                 | 11.70   | 14.79 | 4 848.55      | 0.003 1 |

#### - Simultaneous Transmission

| Test case                                              | E.I.R.P | Limit<br>[mW] | Ratio   |
|--------------------------------------------------------|---------|---------------|---------|
|                                                        | [mW]    |               |         |
| BT_GFSK(2 441 MHz) + SRD_ $\pi/4$ DQPSK (5 730.35 MHz) | 22.92   | 2 706.05      | 0.008 5 |

## 5. Measurement Equipment

| Equipment Name        | Manufacturer | Model No.                                     | Serial No. | Next Cal. Date |
|-----------------------|--------------|-----------------------------------------------|------------|----------------|
| Spectrum Analyzer     | R&S          | FSV30                                         | 100806     | 20.07.30       |
| Wideband Power Sensor | R&S          | NRP-Z81                                       | 102398     | 20.01.25       |
| ATTENUATOR            | R&S          | DNF<br>Dämpfungsglied<br>10 dB in<br>N-50 Ohm | 31212      | 20.05.13       |
| ATTENUATOR            | API Inmet    | 40AH2W-10                                     | 11         | 20.05.15       |

**End of test report**

*KCTL*