

TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: A3LSMV510

Equipment Under Test : Smart Speaker
 Model Name : SM-V510
 Applicant : Samsung Electronics Co., Ltd.
 Manufacturer : Samsung Electronics Co., Ltd.
 Date of Receipt : 2018.07.31
 Date of Test(s) : 2018.08.01 ~ 2018.10.24
 Date of Issue : 2018.10.25

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Nancy Park

Date:

2018.10.25

Technical Manager:



Hyunchoe You

Date:

2018.10.25

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

INDEX

<u>Table of Contents</u>	Page
1. General Information -----	3
2. RF Exposure Evaluation -----	6

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

1.2. Details of Applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, United States, 07058

Contact Person : Chun, Jenni

Phone No. : +1 973 808 6375

1.3. Details of Manufacturer

Company : Samsung Electronics Co., Ltd.

Address : 516229 China Guangdong Province Huizhou City Chenjiang Town Samsung Electronics Huizhou Co. Ltd

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

1.4. Description of EUT

Kind of Product	Smart Speaker	
Model Name	SM-V510	
Power Supply	AC 100 ~ 240 V	
Frequency Range	908.40 MHz, 916.00 MHz (Z-Wave), 2 405 MHz ~ 2 475 MHz (Zigbee), 2 402 MHz ~ 2 480 MHz (Bluetooth, Bluetooth Low Energy), 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20), 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20), 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40), 5 775 MHz (Band 3: 11ac_VHT80), 5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20), 5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40), 5 210 MHz (Band 1: 11ac_VHT80), 5 260 MHz ~ 5 320 MHz (Band 2A: 11a/n_HT20, 11ac_VHT20), 5 270 MHz ~ 5 310 MHz (Band 2A: 11n_HT40, 11ac_VHT40), 5 290 MHz (Band 2A: 11ac_VHT80), 5 500 MHz ~ 5 720 MHz (Band 2C: 11a/n_HT20, 11ac_VHT20), 5 510 MHz ~ 5 710 MHz (Band 2C: 11n_HT40, 11ac_VHT40), 5 530 MHz ~ 5 690 MHz (Band 2C: 11ac_VHT80)	
Modulation Technique	DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 8DPSK, FSK	
Number of Channels	2 channel (Z-Wave), 15 channel (Zigbee), 79 channel (Bluetooth), 40 channel (Bluetooth Low Energy), 11 channel (11b/g/n_HT20), 5 channel (Band 3: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 3: 11n_HT40, 11ac_VHT40), 1 channel (Band 3: 11ac_VHT80), 4 channel (Band 1: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 1: 11n_HT40, 11ac_VHT40), 1 channel (Band 1: 11ac_VHT80), 4 channel (Band 2A: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 2A: 11n_HT40, 11ac_VHT40), 1 channel (Band 2A: 11ac_VHT80), 9 channel (Band 2C: 11a/n_HT20, 11ac_VHT20), 4 channel (Band 2C: 11n_HT40, 11ac_VHT40), 2 channel (Band 2C: 11ac_VHT80)	
Antenna Type	Pattern Embadded Antenna	
Antenna Gain	ANT1	2 402 MHz ~ 2 480 MHz: 1.09 dB i (Bluetooth, Bluetooth Low Energy), 2 412 MHz ~ 2 462 MHz: 1.09 dB i (Wlan_ANT1), 5 180 MHz ~ 5 825 MHz: 0.72 dB i (Wlan_ANT1)
	ANT2	2 412 MHz ~ 2 462 MHz: 1.72 dB i (Wlan_ANT2), 5 180 MHz ~ 5 825 MHz: 2.27 dB i (Wlan_ANT2)
	ANT3	2 405 MHz ~ 2 475 MHz: 0.71 dB i (Zigbee)
	ANT4	908.40 MHz, 916.00 MHz: 1.71 dB i (Z-Wave)
H/W Version	REV.01	
S/W Version	V510.001	

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

1.5. Declaration by the Manufacturer

- Bluetooth, WiFi, Z-wave can transmit simultaneously except for Zigbee.

1.6. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL013064	2018.10.25	Initial

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

2. RF Exposure Evaluation

2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(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 ²	6
30-300	61.4	0.163	1.0	6
300-1 500	-	-	f/300	6
1 500-100 000	-	-	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 ²	30
30-300	27.5	0.073	0.2	30
<u>300-1 500</u>	-	-	<u>f/1500</u>	<u>30</u>
<u>1 500-100 000</u>	-	-	<u>1.0</u>	<u>30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

2.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data
 Test Mode : Normal Operation

2.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Z-Wave

- Maximum tune up tolerance

Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
908.40, 916.00	-3.44	1.71	0.000 134	0.61

Zigbee

- Maximum tune up tolerance

Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 405 ~ 2 475	16.66	0.71	0.010 858	1

Bluetooth

- Maximum tune up tolerance

Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 402 ~ 2 480	11	1.09	0.003 219	1

Bluetooth Low Energy

- Maximum tune up tolerance

Frequency Range (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 402 ~ 2 480	3	1.09	0.000 510	1

WLAN (2.4G)

- Maximum tune up tolerance

Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 412 ~ 2 462	17	4.42	0.027 589	1

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

WLAN (5G)
- Maximum tune up tolerance

Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
5 150 ~ 5 850	14	4.54	0.014 214	1

Note;

- The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm².
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dB i and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

Simultaneous transmission of MPE test exclusion for worst case configuration.

Z-Wave: the ratio is 0.000 134 / 0.61

Bluetooth: the ratio is 0.003 219 / 1

WLAN: the ratio is 0.027 589 / 1

Confirm the sum result of individual MPEs ratio is ≤ 1.0 ;

Z-Wave + Bluetooth + WLAN

= (0.000 134 / 0.61) + (0.003 219 / 1) + (0.027 589 / 1)

= 0.031 028 ≤ 1.0

So this device meets the KDB447498 D01 v06 section 7.2 requirement of "Simultaneous transmission MPE test exclusion"

- End of the Test Report -

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.