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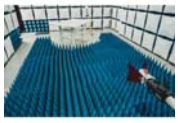

RF EXPOSURE EVALUATION
Maximal Permissible Exposure [MPE]

Applicant Name:
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Date of Testing:
5/9-6/13/2018
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1805080100-01.A3L

FCC ID:	**A3LETWV525**
IC:	**649E-ETWV525**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model / HVIN:	ET-WV525
EUT Type:	Indoor Access Point
FCC Rule Part:	FCC Part 1 (§1.1310) and Part 2 (§2.1091)
ISED Specifications:	RSS-102 Issue 5, Health Canada Safety Code 6
Test Procedure(s):	KDB 447498 D01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC KDB 447498 D01. Test results reported herein relate only to the item(s) tested.

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.

Randy Ortanez
President

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1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Introduction

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations and RSS-102 of Industry Canada.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: 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) and RSS-102.

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	…	…	f/300	6
1500-100,000	…	…	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

Table 1-1. Limits for Maximum Permissible Exposure (MPE) from §1.1307(b)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	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
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
* Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Table 1-2. Limits for Maximum Permissible Exposure (MPE) from RSS-102

1.2 EUT Description

The **Samsung Model: ET-WV525** is an Indoor Access Point containing two 2.4GHz transmit output ports and two separate 5GHz transmit output ports capable for transmitting 802.11a/b/g/n/ac modes. The device also contains Zigbee, Z-Wave, and Bluetooth transmitters.

EUT:

Model / HVIN:	ET-WV525
Grantee:	Samsung Electronics Co., Ltd.
FCC ID:	A3LETWV525
IC:	649E-ETWV525
Antenna(s):	Please see technical description for list of available antenna options

1.3 MPE Requirements Overview

Three different categories of transmitters are defined by the FCC KDB 447498 D01. These categories are fixed installation, mobile, and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.

- **Mobile Devices:** a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.

- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/ Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

- **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

The **Samsung Indoor Access Point FCC ID: A3LETWV525** is evaluated to the Mobile Device requirements and is considered a device to be used by the General Population/Uncontrolled Exposure.

1.4 Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The power generated by each transmitter used in this product was initially measured by a power meter and the powers were recorded. Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at a distance of 20cm.

Friis Transmission Formula

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

Where,

P_d = Power Density (mW/cm^2) $\pi = 3.1416$
P_{out} = output power to antenna (mW) r = distance between observation point and center of the radiator (cm)
G = gain of antenna in linear scale

Calculated MPE

The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1-1 and Table 1-2.

There is no co-location between the electric fields of any two transmitters therefore following power densities are calculated for each individual transmitter by frequency at 20cm spacing:

Frequency	2437	MHz		
FCC Limit	1.000	mW/cm^2		
ISED Limit	5.404	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dBi), G =	-0.5	dBi	0.251	W
Power Density (S) =	**0.0445**	mW/cm^2	(at 20cm)	
	0.4454	W/m^2	(at 20cm)	
FCC Minimum Distance =	**4.221**	cm		
ISED Minimum Distance =	**5.742**	cm		

Table 1-3. Calculated MPE Data for WLAN 2.4GHz Band (Antenna 1)

Frequency:	2437	MHz		
FCC Limit:	1.000	mW/cm^2		
ISED Limit	5.404	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	24	dBm	251.19	mW
TX Ant Gain (dBi), G =	-0.4	dBi	0.251	W
Power Density (S) =	**0.0456**	mW/cm^2	(at 20cm)	
	0.4558	W/m^2	(at 20cm)	
FCC Minimum Distance =	**4.270**	cm		
ISED Minimum Distance =	**5.808**	cm		

Table 1-4. Calculated MPE Data for WLAN 2.4GHz Band (Antenna 2)

Frequency	5825	MHz		
FCC Limit:	1.000	mW/cm^2		
ISED Limit	9.803	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	23	dBm	199.53	mW
TX Ant Gain (dB), G =	-0.1	dBi	0.200	W
Power Density (S) =	**0.0388**	mW/cm^2	(at 20cm)	
	0.3879	W/m^2	(at 20cm)	
FCC Minimum Distance =	**3.939**	cm		
ISED Minimum Distance =	**3.979**	cm		

Table 1-5. Calculated MPE Data for UNII 5GHz Band (Antenna 1)

Frequency	5825	MHz		
FCC Limit:	1.000	mW/cm^2		
ISED Limit	9.803	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	23	dBm	199.53	mW
TX Ant Gain (dB), G =	-0.6	dBi	0.200	W
Power Density (S) =	**0.0346**	mW/cm^2	(at 20cm)	
	0.3457	W/m^2	(at 20cm)	
FCC Minimum Distance =	**3.719**	cm		
ISED Minimum Distance =	**3.756**	cm		

Table 1-6. Calculated MPE Data for UNII 5GHz Band (Antenna 2)

Frequency	2440	MHz		
FCC Limit	1.000	mW/cm^2		
ISED Limit	5.409	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	-10.5	dBm	0.09	mW
TX Ant Gain (dB), G =	-0.6	dBi	0.0001	W
Power Density (S) =	**0.0000**	mW/cm^2	(at 20cm)	
	0.0002	W/m^2	(at 20cm)	
FCC Minimum Distance =	**0.079**	cm		
ISED Minimum Distance =	**0.107**	cm		

Table 1-7. Calculated MPE Data for Bluetooth LE

Frequency	2440	MHz		
FCC Limit:	1.000	mW/cm^2		
ISED Limit	5.409	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	17.5	dBm	56.23	mW
TX Ant Gain (dB), G =	-0.6	dBi	0.056	W
Power Density (S) =	**0.0097**	mW/cm^2	(at 20cm)	
	0.0974	W/m^2	(at 20cm)	
FCC Minimum Distance =	**1.974**	cm		
ISED Minimum Distance =	**2.684**	cm		

Table 1-8. Calculated MPE Data for Zigbee

Frequency	908.4	MHz		
FCC Limit	1.000	mW/cm^2		
ISED Limit	2.753	W/m^2		
Distance (cm), R =	20	cm		
Power (dBm), P =	-4.5	dBm	0.35	mW
TX Ant Gain (dB), G =	-0.7	dBi	0.0004	W
Power Density (S) =	**0.0001**	mW/cm^2	(at 20cm)	
	0.0006	W/m^2	(at 20cm)	
FCC Minimum Distance =	**0.155**	cm		
ISED Minimum Distance =	**0.295**	cm		

Table 1-9. Calculated MPE Data for Zwave

	Power Density (W/m^2)	Limit (W/m2)	Percent MPE Used (%)
Transmitter #1 (2.4GHz Ant1)	0.4454	5.4040	8.24
Transmitter #2 (2.4GHz Ant2)	0.4558	5.4040	8.24
Transmitter #3 (5GHz Ant1)	0.3879	9.8025	8.43
Transmitter #4 (5GHz Ant2)	0.3457	9.8025	3.96
Transmitter #5 (BTLE)	0.0002	5.4085	3.53
Transmitter #6 (Zigbee)	0.0974	5.4085	0.003
Transmitter #6 (Zwave)	0.0006	2.7531	0.02
Total			32.43

Table 1-10. Cumulative Results for Multiple Transmitters

1.5 Summary of Results

Transmit Mode	Frequency Band [MHz]	Maximum Antenna Gain [dBi]	MPE @ 20cm (mW/cm^2)	MPE @ 20cm (W/m^2)	Test Result
2.4GHz 802.11b/g/n/ac	2412 - 2462	-0.5	0.0445	0.4454	PASS
2.4GHz 802.11b/g/n/ac	2412 – 2462	-0.4	0.0456	0.4558	PASS
5GHz 802.11a/n/ac	5180 – 5240, 5745 - 5825	-0.1	0.0388	0.3879	PASS
5GHz 802.11a/n/ac	5180 – 5240, 5745 – 5825	-0.6	0.0346	0.3457	PASS
Bluetooth LE	2402 – 2480	-0.6	0.00002	0.0002	PASS
Zigbee	2405 – 2480	-0.6	0.0097	0.0974	PASS
Z-Wave	908.4 – 916.4	-0.7	0.0001	0.0006	PASS

Table 1-11. Maximum Permissible Exposure Summary Table

2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 20cm separation distance as specified in §2.1091 of the FCC Rules, RSS-102 of the Innovation, Science and Economic Development of Canada Rules, and Regulations and Health Canada Safety Code 6. An appropriate RF exposure compliance statement will be placed in the user's manual.