CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970 Fax: +82-31-624-9501
www.e-ctk.com

RF EXPOSURE EVALUATION

Applicant	**: Samsung Electronics Co., Ltd.**
Applicant Address	**: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea**
Kind of Product	**: Wi-Fi/BT Transceiver**
Equipment model name	**: WCP732M**
FCC ID	**: A3LWCP732M**
Certification Number IC	**: 649E-WCP732M**
Antenna type	**: PIFA Antenna**
Antenna Gain	**: BT, BLE: 2.1 dBi WLAN 5GHz : 0.87 dBi (ANT-L), 3.00 dBi (ANT-R) WLAN 2.4GHz : 1.36 dBi (ANT-L), 2.04 dBi (ANT-R)**

Standard Requirement

The following RF exposure procedures are applicable :

- FCC Rules

Part 1.1310 Radiofrequency radiation exposure limits

Table 1 below sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

Table 1—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(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
300-1,500			f/1500	30
1,500-100,000			**1.0**	30

f = frequency in MHz
** = Plane-wave equivalent power density*

- ISED Rules

RSS-102 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

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/m2)	Reference Period (minutes)
0.003-10	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).*

MPE Calculations

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user. The MPE calculation for this exposure is shown below.

The peak radiated output power (EIRP) is calculated as follows:

EIRP = P + G	Where, P = Power input to the antenna (mW) G = Power gain of the antenna (dBi)

The numeric gain(G) of the antenna with a gain specified in dB is determined by:

$G = Log^{-1}$ (dB antenna gain / 10)

Power density at the specific separation:

$S = PG/(4R^2\pi)$	Where, S = Maximum power density (mW/cm^2) P = Power input to the antenna (mW) G = Numeric power gain of the antenna R = Distance to the center of the radiation of the antenna (20cm = limit for MPE)

Estimated safe separation:

$R = \sqrt{(PG / 4\pi)}$	Where, P = Power input to the antenna (mW) G = Numeric power gain of the antenna R = Distance to the center of the radiation of the antenna (20cm = limit for MPE)

RF Exposure Results

Mode	P (dBm)	G (dBi)	EIRP (dBm)	EIRP (mW)	Power Density		R (cm)
					FCC (mW/cm^2)	ISED (W/m^2)	
BT	11.752	2.1	13.85	24.27	**0.0048**	**0.048**	20
BLE	11.922	2.1	14.02	25.23	**0.0050**	**0.050**	
WLAN 2.4 GHz	20.05	2.04	22.09	161.81	**0.0322**	**0.322**	
WLAN 5 GHz	21.68	3.0	24.68	293.76	**0.0584**	**0.584**	

Multiple chain transmitters

Mode	P (dBm)	G (dBi)	EIRP (dBm)	EIRP (mW)	Power Density		R (cm)
					FCC (mW/cm^2)	ISED (W/m^2)	
BLE (Worst Case)	11.922	2.1	14.02	25.23			20
WLAN 2.4 GHz	20.05	2.04	22.09	161.81			
WLAN 5 GHz	21.68	3.0	24.68	293.76			
Combined				480.81	**0.0957**	**0.957**	