RF EXPOSURE EVALUATION

Applicant	SJI Co.,Ltd
Applicant Address	54-33, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea
FCC ID	2AS8LUWM200
Product Description	UWB Radio Communication Device
Basic model	UWM210
Variant Model name	-
Operating Frequency	2 402 MHz - 2 480 MHz, 6 489.6 MHz – 7 987.2 MHz
Power Source	DC 3.3 V

** RF Exposure Evaluation**

Exemption Limits for Routine Evaluation

SAR Test Exclusion Thresholds for 100 MHz - 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table, The equation and threshold in Note 1 must be applied to determine SAR test exclusion.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

MHz	30	35	40	45	50	mm
150	232	271	310	349	387	*SAR Test Exclusion Threshold* (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Note 1 :
The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by :

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]* [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1f) is applied to determine SAR test exclusion.

BLE Output Power :

Mode	Frequency (MHz)	Measured conducted peak power (dBm)	Power tolerance [dB]	Duty Cycle Factor (dB)	Maximum conducted power (mW)	SAR Test Exclusion Threshold (mW)
Bluetooth LE	2 402 – 2 480	6.622	+ 2.0	-1.864	4.741	10

Per FCC KDB 447498 D01v06, the SAR exclusion threshold for distances ≤50mm is defined by the following equation :

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]* [√f(GHz)] ≤ 3.0

Base on the maximum conducted power of the antenna to use separation distance,
SAR was not required;

Bluetooth LE 1 Mbps : [(4.741 / 5) * √2.480] = 2.351 (≤ 3.0)

RF Exposure for devices that operate above 6 GHz (§ 1.1310)

Portable devices that transmit at frequencies above 6 GHz shall be evaluated in terms of the MPE limits specified in Table 1 to § 1.1310(e)(1) of this chapter. A minimum separation distance applicable to the operating configurations and exposure conditions of the device shall be used for the evaluation. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

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*

The EUT will only be used with a separation of 0.5 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 (0.5cm = limit for MPE)

UWB Output Power :

Mode	Frequency (MHz)	Max Radiated power (dBm)	Max Radiated power (mW)	Power Density (mW/cm^2)	Limit (mW/cm^2)	R (cm)
UWB	6 489.6 – 7 987.2	-5.06	0.312	0.0993	1.0	0.5