

## RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

FCC ID: 2A03G-E2

### EUT Specification

<b>EUT</b>	<b>e+Smart-Home WiFi System</b>
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.18GHz ~ 5.24GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others: 2.402GHz~2.480GHz
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna diversity</b>	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	2.4GHz WiFi: 18.65dBm (0.0733W) 5.1GHz WIFI: 18.52dBm (0.0711W)
<b>Antenna gain (Max)</b>	2.4GHz WiFi: 1.5 dBi, 5.1GHz WiFi: 2 dBi
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm <sup>2</sup> )	Average Time
<b>(A) Limits for Occupational/Control Exposures</b>				
300-1500	--	--	<b>F/300</b>	<b>6</b>
1500-100000	--	--	<b>5</b>	<b>6</b>
<b>(B) Limits for General Population/Uncontrol Exposures</b>				
300-1500	--	--	<b>F/1500</b>	<b>6</b>
1500-100000	--	--	<b>1</b>	<b>30</b>

## Friis transmission formula: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

$P_d$  = Power density in  $mW/cm^2$

$P_{out}$  = output power to antenna in Mw

$G$  = gain of antenna in linear scale

$\pi = 3.1416$

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

$P_d$  the limit of MPE,  $1mW/cm^2$ . If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

## Measurement Result

### 2.4GHz

#### ANT 1:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits ( $mW/cm^2$ )
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	( $mW/cm^2$ )	
802.11b	2412	18.65	18.65±1	19.65	1.5	0.0259	1
	2437	17.96	17.96±1	18.96	1.5	0.0221	1
	2462	17.23	17.23±1	18.23	1.5	0.0187	1
802.11g	2412	17.21	17.21±1	18.21	1.5	0.0186	1
	2437	16.45	16.45±1	17.45	1.5	0.0156	1
	2462	15.24	15.24±1	16.24	1.5	0.0118	1
802.11n (HT20)	2412	15.59	15.59±1	16.59	1.5	0.0128	1
	2437	15.25	15.25±1	16.25	1.5	0.0119	1
	2462	15.36	15.36±1	16.36	1.5	0.0122	1
802.11n (HT40)	2422	15.23	15.23±1	16.23	1.5	0.0118	1
	2437	14.24	14.24±1	15.24	1.5	0.0094	1
	2452	14.16	14.16±1	15.16	1.5	0.0092	1

**ANT 2:**

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits (mW/cm <sup>2</sup> )
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm <sup>2</sup> )	
802.11b	2412	18.36	18.36±1	19.36	1.5	0.0243	1
	2437	17.99	17.99±1	18.99	1.5	0.0223	1
	2462	17.55	17.55±1	18.55	1.5	0.0201	1
802.11g	2412	17.24	17.24±1	18.24	1.5	0.0187	1
	2437	15.68	15.68±1	16.68	1.5	0.0131	1
	2462	15.32	15.32±1	16.32	1.5	0.0120	1
802.11n (HT20)	2412	15.11	15.11±1	16.11	1.5	0.0115	1
	2437	15.17	15.17±1	16.17	1.5	0.0116	1
	2462	14.98	14.98±1	15.98	1.5	0.0111	1
802.11n (HT40)	2422	14.88	14.88±1	15.88	1.5	0.0109	1
	2437	14.67	14.67±1	15.67	1.5	0.0104	1
	2452	14.23	14.23±1	15.23	1.5	0.0094	1

**ANT1+ANT2:**

Operating Mode	Channel Frequency (MHz)	ANT 1 Power density at 20cm (mW/ cm <sup>2</sup> )	ANT 2 Power density at 20cm (mW/ cm <sup>2</sup> )	Power density at 20cm (mW/ cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
802.11n (HT20)	2412	0.0128	0.0115	0.0243	1
	2437	0.0119	0.0116	0.0235	1
	2462	0.0122	0.0111	0.0233	1
802.11n (HT40)	2422	0.0118	0.0109	0.0227	1
	2437	0.0094	0.0104	0.0198	1
	2452	0.0092	0.0094	0.0186	1

\*\*\*Note: The two antennas (ANT1 & ANT2) are exactly the same, so the antenna gain used for calculation is 1.5dBi

**5.1GHz WiFi:**  
for client device  
**ANT 1:**

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm <sup>2</sup> )	(mW/cm <sup>2</sup> )
802.11a	5180	12.56	12.56±1	13.56	2	0.0072	1
	5200	12.36	12.36±1	13.36	2	0.0068	1
	5240	12.69	12.69±1	13.69	2	0.0074	1
802.11n20	5180	12.58	12.58±1	13.58	2	0.0072	1
	5200	12.11	12.11±1	13.11	2	0.0065	1
	5240	12.47	12.47±1	13.47	2	0.0070	1
802.11n40	5190	11.98	11.98±1	12.98	2	0.0063	1
	5230	11.69	11.69±1	12.69	2	0.0059	1
802.11ac20	5180	11.88	11.88±1	12.88	2	0.0061	1
	5200	11.59	11.59±1	12.59	2	0.0057	1
	5240	11.99	11.99±1	12.99	2	0.0063	1
802.11ac40	5190	12.02	12.02±1	13.02	2	0.0063	1
	5230	12.04	12.04±1	13.04	2	0.0063	1

**ANT 2:**

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm <sup>2</sup> )	(mW/cm <sup>2</sup> )
802.11a	5180	12.55	12.55±1	13.55	2	0.0071	1
	5200	12.54	12.54±1	13.54	2	0.0071	1
	5240	12.46	12.46±1	13.46	2	0.0070	1
802.11n20	5180	12.77	12.77±1	13.77	2	0.0075	1
	5200	12.39	12.39±1	13.39	2	0.0069	1
	5240	12.12	12.12±1	13.12	2	0.0065	1
802.11n40	5190	12.05	12.05±1	13.05	2	0.0064	1
	5230	11.98	11.98±1	12.98	2	0.0063	1
802.11ac20	5180	11.93	11.93±1	12.93	2	0.0062	1
	5200	11.28	11.28±1	12.28	2	0.0053	1
	5240	11.34	11.34±1	12.34	2	0.0054	1
802.11ac40	5190	11.29	11.29±1	12.29	2	0.0053	1
	5230	11.20	11.20±1	12.20	2	0.0052	1

**ANT1+ANT2:**

Operating Mode	Channel Frequency (MHz)	ANT 1 Power density at 20cm (mW/ cm <sup>2</sup> )	ANT 2 Power density at 20cm (mW/ cm <sup>2</sup> )	Power density at 20cm (mW/ cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
802.11a	5180	0.0072	0.0071	0.0143	1
	5200	0.0068	0.0071	0.0139	1
	5240	0.0074	0.0070	0.0144	1
802.11n20	5180	0.0072	0.0075	0.0147	1
	5200	0.0065	0.0069	0.0134	1
	5240	0.0070	0.0065	0.0135	1
802.11n40	5190	0.0063	0.0064	0.0127	1
	5230	0.0059	0.0063	0.0122	1
802.11ac20	5180	0.0061	0.0062	0.0123	1
	5200	0.0057	0.0053	0.0110	1
	5240	0.0063	0.0054	0.0117	1
802.11ac40	5190	0.0063	0.0053	0.0116	1
	5230	0.0063	0.0052	0.0115	1

**for an indoor access point****ANT 1:**

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm <sup>2</sup> )	(mW/cm <sup>2</sup> )
802.11a	5180	15.23	15.23±1	16.23	2	0.0132	1
	5200	<b>15.87</b>	15.87±1	16.87	2	0.0153	1
	5240	15.33	15.33±1	16.33	2	0.0135	1
802.11n20	5180	14.85	14.85±1	15.85	2	0.0121	1
	5200	15.12	15.12±1	16.12	2	0.0129	1
	5240	14.75	14.75±1	15.75	2	0.0119	1
802.11n40	5190	15.16	15.16±1	16.16	2	0.0130	1
	5230	14.98	14.98±1	15.98	2	0.0125	1
802.11ac20	5180	14.23	14.23±1	15.23	2	0.0105	1
	5200	14.68	14.68±1	15.68	2	0.0117	1
	5240	14.98	14.98±1	15.98	2	0.0125	1
802.11ac40	5190	15.21	15.21±1	16.21	2	0.0132	1
	5230	15.46	15.46±1	16.46	2	0.0140	1

**ANT 2:**

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm <sup>2</sup> )	(mW/cm <sup>2</sup> )
802.11a	5180	15.55	15.55±1	16.55	2	0.0142	1
	5200	14.99	14.99±1	15.99	2	0.0125	1
	5240	<b>15.69</b>	15.69±1	16.69	2	0.0147	1
802.11n20	5180	14.88	14.88±1	15.88	2	0.0122	1
	5200	15.46	15.46±1	16.46	2	0.0140	1
	5240	14.70	14.70±1	15.7	2	0.0117	1
802.11n40	5190	14.88	14.88±1	15.88	2	0.0122	1
	5230	14.91	14.91±1	15.91	2	0.0123	1
802.11ac20	5180	14.85	14.85±1	15.85	2	0.0121	1
	5200	14.61	14.61±1	15.61	2	0.0115	1
	5240	14.90	14.90±1	15.9	2	0.0123	1
802.11ac40	5190	15.36	15.36±1	16.36	2	0.0136	1
	5230	15.49	15.49±1	16.49	2	0.0141	1

**ANT1+ANT2:**

Operating Mode	Channel Frequency (MHz)	ANT 1 Power density at 20cm (mW/ cm <sup>2</sup> )	ANT 2 Power density at 20cm (mW/ cm <sup>2</sup> )	Power density at 20cm (mW/ cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
802.11a	5180	0.0132	0.0142	0.0274	1
	5200	0.0153	0.0125	0.0278	1
	5240	0.0135	0.0147	0.0282	1
802.11n20	5180	0.0121	0.0122	0.0243	1
	5200	0.0129	0.0140	0.0269	1
	5240	0.0119	0.0117	0.0236	1
802.11n40	5190	0.0130	0.0122	0.0252	1
	5230	0.0125	0.0123	0.0248	1
802.11ac20	5180	0.0105	0.0121	0.0226	1
	5200	0.0117	0.0115	0.0232	1
	5240	0.0125	0.0123	0.0248	1
802.11ac40	5190	0.0132	0.0136	0.0268	1
	5230	0.0140	0.0141	0.0281	1

\*\*\*Note: The two antennas (ANT1 & ANT2) are exactly the same, so the antenna gain used for calculation is 2dBi