

RF Exposure Evaluation

1. Client Information

FCC ID: 2ABC5-E0062	
EUT	Smart Home
Model Name	SMT156, SMT97, SMT101
Frequency band (Operating)	<input checked="" type="checkbox"/> BT: 2.402GHz ~ 2.480GH <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> RLAN: 5.180GHz ~ 5.240GHz <input type="checkbox"/> RLAN: 5.260GHz ~ 5.320GHz <input type="checkbox"/> RLAN: 5.500GHz ~ 5.700GHz <input checked="" type="checkbox"/> RLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> RLAN: 5.925GHz ~ 6.425GHz <input checked="" type="checkbox"/> RLAN: 6.425GHz ~ 6.525GHz <input checked="" type="checkbox"/> RLAN: 6.525GHz ~ 6.875GHz <input checked="" type="checkbox"/> RLAN: 6.875GHz ~ 7.125GHz <input checked="" type="checkbox"/> Zigbee: 2.405GHz ~ 2.480GHz
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others _____
Antenna diversity	<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
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

2. The RF Exposure Evaluation for FCC

Single RF Sources Exemptions:

Option	Refer Standard	Exemption Exposure Thresholds
A	§ 1.1307(b)(3)(i)(A)	The available maximum time-averaged power is no more than 1 mW
B	§ 1.1307(b)(3)(i)(B)	$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$ $x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right)$ $ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$



C	§ 1.1307(b)(3)(i)(C)	RF Source frequency (MHz)	Threshold ERP (watts)
		0.3-1.34	1,920 R ² .
		1.34-30	3,450 R ² /f ² .
		30-300	3.83 R ² .
		300-1,500	0.0128 R ² f.
		1,500-100,000	19.2R ² .

f is in MHz, R is in meters, R>λ/2π

Example power threshold for separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Simultaneous Transmission SAR Test Exemption:

Refer Standard	Exemption Exposure Thresholds
§ 1.1307(b)(3)(ii)(A)	The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
§ 1.1307(b)(3)(ii)(B)	$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$ <p>a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th}, including existing exempt transmitters and those being added.</p> <p>b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.</p> <p>c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.</p>



	<p>P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).</p> <p>$P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.</p> <p>ERP_j = the ERP of fixed, mobile, or portable RF source j.</p> <p>$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$ according to the applicable formula of paragraph (b)(3)(i)(C) of this section.</p> <p>$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.</p> <p>$Exposure\ Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from § 1.1310 of this chapter.</p>
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Calculation:

Test separation: 20cm									
Test Mode	Conducted Power (dBm)	Gain (dBi)	EIRP (dBm)	ERP (dBm)	Turn-up Power Tolerance (dB)	Max power of tune up tolerance (dBm)	Max power of tune up tolerance (mW)	Option	Limit P_{th} (mW)
BDR+EDR	10.34	1.27	11.61	9.46	±1	10.46	11.117	B	3060
BLE	9.67	1.27	10.94	8.79	±1	9.79	9.528	B	3060
Zigbee	21.38	2.74	24.12	21.97	±1	22.97	198.153	B	3060
Wi-Fi 2.4G	16.94	1.27	18.21	16.06	±1	17.06	50.816	B	3060
Wi-Fi 5.2G	17.46	2.08	19.54	17.39	±1	18.39	69.024	B	3060
Wi-Fi 5.8G	16.04	1.7	17.74	15.59	±1	16.59	45.604	B	3060
Wi-Fi UNII5	9.73	3.05	12.78	10.63	±1	11.63	14.555	C	2091
Wi-Fi UNII6	10.05	2.33	12.38	10.23	±1	11.23	13.274	C	2091
Wi-Fi UNII7	9.31	3.79	13.10	10.95	±1	11.95	15.668	C	2091
Wi-Fi UNII8	9.65	3.55	13.20	11.05	±1	12.05	16.032	C	2091

EIRP= Conducted Power(dBm)+Gain(dBi)
 ERP(dBm)=EIRP(dBm)-2.15
 The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 D04, No SAR is required.

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No. Applicable Simultaneous Transmission

1. BT+Zigbee
2. WiFi+Zigbee

The Maximum simultaneous transmission:

Test Mode	Conducted Power (dBm)	Gain (dBi)	EIRP (dBm)	ERP (dBm)	Turn-up Power Tolerance (dB)	Max power of tune up tolerance (dBm)	Max power of tune up tolerance (mW)	Option	Limit P _{th} (mW)	TL Radio (mW)	Sum Radio	Radio Limit
Zigbee	21.38	2.74	24.12	21.97	±1	22.97	198.153	B	3060	0.0648	0.0874	≤1
Wi-Fi 5.2G	17.46	2.08	19.54	17.39	±1	18.39	69.024	B	3060	0.0226		

EIRP= Conducted Power(dBm)+Gain(dBi)

ERP(dBm)=EIRP(dBm)-2.15

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 D04, No SAR is required.

For multiple RF sources equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

