RF Exposure Evaluation

According to KDB 447498 D01 General RF Exposure Guidance v06 and part 2.1091， Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied.

Limits

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)

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 Exposures				
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
300–1500			f/300	6
1500–100,000			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
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

Friis transmission formula: **$Pd = (Pout*G)/(4*pi*r^2)$**

Where

Pd = power density in mW/cm^2, **Pout** = 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

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

Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

Test Result of RF Exposure Evaluation

	Modulation	Frequency MHz	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Max Output power to antenna (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)	Result
BLE	GFSK	2402	-0.12	0±1.0	1.0	1.259	0.000295	1.0	PASS
		2440	-0.10	0±1.0	1.0	1.259	0.000295	1.0	PASS
		2480	0.11	0±1.0	1.0	1.259	0.000295	1.0	PASS
Wifi 2.4g	802.11b	2412	18.02	18±1.0	19.0	79.433	0.033708	1.0	PASS
		2437	17.71	17±1.0	18.0	63.096	0.026775	1.0	PASS
		2462	18.28	18±1.0	19.0	79.433	0.033708	1.0	PASS
	802.11g	2412	15.84	15±1.0	16.0	39.811	0.016894	1.0	PASS
		2437	15.55	15±1.0	16.0	39.811	0.016894	1.0	PASS
		2462	16.11	16±1.0	17.0	50.119	0.021268	1.0	PASS
	802.11n(20)	2412	15.98	16±1.0	17.0	50.119	0.021268	1.0	PASS
		2437	15.79	16±1.0	17.0	50.119	0.021268	1.0	PASS
		2462	16.36	16±1.0	17.0	50.119	0.021268	1.0	PASS
	802.11n(40)	2422	16.64	16±1.0	17.0	50.119	0.021268	1.0	PASS
		2437	16.54	16±1.0	17.0	50.119	0.021268	1.0	PASS
		2452	16.68	16±1.0	17.0	50.119	0.021268	1.0	PASS

	Modulation	Frequency (MHz)	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
Wifi5.2g	802.11a20	5180	-0.84	-1±1.0	0	1.000	0.000503	1.0	PASS
		5200	-0.87	-1±1.0	0	1.000	0.000503	1.0	PASS
		5240	-0.91	-1±1.0	0	1.000	0.000503	1.0	PASS
	802.11n20	5180	-1.18	-1±1.0	0	1.000	0.000503	1.0	PASS
		5200	-0.74	-1±1.0	0	1.000	0.000503	1.0	PASS
		5240	-0.69	-1±1.0	0	1.000	0.000503	1.0	PASS
	802.11n40	5190	-0.31	-1±1.0	0	1.000	0.000503	1.0	PASS
		5240	-0.19	-1±1.0	0	1.000	0.000503	1.0	PASS

	Modulation	Frequency (MHz)	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
Wifi5.3g	802.11a20	5260.00	-1.65	-2±1.0	-1.0	0.794	0.000317	1.0	PASS
		5300.00	-1.08	-2±1.0	-1.0	0.794	0.000317	1.0	PASS
		5320.00	-1.68	-2±1.0	-1.0	0.794	0.000317	1.0	PASS
	802.11n20	5260.00	-1.05	-1±1.0	0	1.000	0.000400	1.0	PASS
		5300.00	-0.82	-1±1.0	0	1.000	0.000400	1.0	PASS
		5320.00	-1.53	-2±1.0	-1.0	0.794	0.000317	1.0	PASS
	802.11n40	5270.00	-0.99	-1±1.0	0	1.000	0.000400	1.0	PASS
		5310.00	-1.26	-1±1.0	0	1.000	0.000400	1.0	PASS

	Modulation	Frequency (MHz)	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
Wifi5.6g	802.11a20	5500.00	0.32	0±1.0	1.0	1.259	0.000510	1.0	PASS
		5600.00	0.85	1±1.0	2.0	1.585	0.000642	1.0	PASS
		5700.00	-0.09	0±1.0	1.0	1.259	0.000510	1.0	PASS
	802.11n20	5500.00	0.25	0±1.0	1.0	1.259	0.000510	1.0	PASS
		5600.00	1.24	1±1.0	2.0	1.585	0.000781	1.0	PASS
		5700.00	0.14	0±1.0	1.0	1.259	0.000510	1.0	PASS
	802.11n40	5510.00	1.27	1±1.0	2.0	1.585	0.000642	1.0	PASS
		5590.00	1.37	1±1.0	2.0	1.585	0.000642	1.0	PASS
		5670.00	1.22	1±1.0	2.0	1.585	0.000642	1.0	PASS

	Modulation	Frequency (MHz)	Output power to antenna (dBm)	Target power W/tolerance (dBm)	Max Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
Wifi5.8g	802.11a20	5745	-1.02	-1±1.0	0	1.000	0.000438	1.0	PASS
		5785	-1.39	-1±1.0	0	1.000	0.000438	1.0	PASS
		5825	-3.04	-3±1.0	-2	0.631	0.000277	1.0	PASS
	802.11n20	5745	-0.99	-1±1.0	0	1.000	0.000438	1.0	PASS
		5785	-1.30	-1±1.0	0	1.000	0.000438	1.0	PASS
		5825	-2.87	-3±1.0	-2	0.631	0.000277	1.0	PASS
	802.11n40	5755	-0.83	-1±1.0	0	1.000	0.000438	1.0	PASS
		5795	-1.63	-2±1.0	-1	0.794	0.000348	1.0	PASS

Here,
For 88.1-107.9MHz

Frequency (MHz)	Field strength (dBuV/m)	EIRP (dBm)	Max tune-up (mW)	Power Density at R=20cm (mW/cm2)	Limit (mW/cm2)
88.1	60.45	-34.75	0.000334965	0.00000006664	0.2

Remark：1. BT Antenna gain is 0.71dBi,
Wifi Antenna gain is 3.29dBi(WIFI 2.4G); 4.03 dBi(WIFI5.2G) ; 3.03 dBi(WIFI5.3G)
3.09 dBi(WIFI5.6G); 3.43 dBi(WIFI5.8G) ; FM Antenna gain is 0dBi

2. Wifi2.4g, wifi5.2g donot transmit at the same time

BT and wifi and FM can transmit at the same time

3. In the case of simultaneous launches for wifi and BT:

The Max Calc. Thresholds : BT: 000295, Wifi: 0.033708 FM:0.0.00000006664

BT and Wifi and FM: 0.00295+0.033708+(0.00000006664/0.2) =0.036658333 ≤ 1

So a SAR test is not required