

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: 2AS9D-MAGIC421MAXS

EUT Specification

EUT	Wifi Digital Photo Frame
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☒ WLAN: 5.18GHz ~ 5.24GHz ☒ WLAN: 5.745GHz ~ 5.825GHz ☒ Others: BDR+EDR: 2402-2480MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others ____
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm ²) ☒ General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Antenna gain (Max)	BT: -0.58dBi 2.4G WiFi: 2.53dBi 5.1G WiFi ANT A: 2.07dBi; ANT B: 2.1dBi 5.8G WiFi ANT A: 1.93dBi; ANT B: 2.33dBi
Directional Gain (Max)	5.1G WiFi: 5.10 dBi 5.8G WiFi: 5.14dBi
Evaluation applied	☒ MPE Evaluation ☐ 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 ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale

π = 3.1416

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

P_d the limit of MPE, 1mW/cm². 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.

Max Measurement Result

Operating Mode	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits (mW/cm ²)
	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	
BDR+EDR	-0.231	-0.231 ±1	0.769	-0.58	-0.0001	1
2.4G WIFI	15.55	15.55 ±1	16.55	2.53	0.0228	1
5.2G WIFI ANT A	16.24	16.24 ±1	17.24	2.07	0.0218	1
5.2G WIFI ANT B	16.09	16.09 ±1	17.09	2.1	0.0214	1
5.8G WIFI ANT A	16.19	16.19 ±1	17.19	1.93	0.0201	1
5.8G WIFI ANT B	16.04	16.04 ±1	17.04	2.33	0.0235	1

For Transmit Simultaneously Mode:

5.2G WIFI A+B:

$$\begin{aligned} &= \text{MPE}_{5.2\text{G WiFi(A)}} / \text{Limit}_{\text{above 1500}} + \text{MPE}_{2.4\text{G WiFi(B)}} / \text{Limit}_{\text{above 1500}} \\ &= 0.0218 + 0.0214 \\ &= 0.0432 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)} \end{aligned}$$

5.8G WIFI A+B:

$$\begin{aligned} &= \text{MPE}_{5.2\text{G WiFi(A)}} / \text{Limit}_{\text{above 1500}} + \text{MPE}_{2.4\text{G WiFi(B)}} / \text{Limit}_{\text{above 1500}} \\ &= 0.0214 + 0.0201 \\ &= 0.0415 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)} \end{aligned}$$

Bluetooth+2.4G WiF+5.1G WiFi(MIMO)+5.8G WiFi(MIMO):

$$\begin{aligned} &= \text{MPE}_{\text{BT}} / \text{Limit}_{\text{above 1500}} + \text{MPE}_{2.4\text{G WiFi}} / \text{Limit}_{\text{above 1500}} + \text{MPE}_{5.2\text{G WiFi(A+B)}} / \text{Limit}_{\text{above 1500}} \\ &\quad + \text{MPE}_{5.8\text{G WiFi(A+B)}} / \text{Limit}_{\text{above 1500}} \\ &= -0.0001 + 0.0228 + 0.0432 + 0.0415 \\ &= 0.1074 \text{ (mW/cm}^2\text{)} < 1 \text{ (mW/cm}^2\text{)} \end{aligned}$$