

FCC ID : 2BLJ3-SIGMA-01

1. 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).

Limits for Maximum Permissible Exposure (MPE).

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm²)	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: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where

P_d = Power density in mW/cm².

P_{out} =output power to antenna in mW.

G = Numeric gain of the antenna relative to isotropic antenna.

π =3.1416.

R = distance between observation point and center of the radiator in 20cm.

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.

2. EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product	SIGMA-ONE
Model Number	MT-SIG1Y24-001
Power Supply:	AC 120V/60Hz by Adapter Adapter: Model: SOY-1200300EU-056 Input: 100-240V~50/60Hz, 1.2A Max Output: 12V, 3A, 36W
Temperature Range:	-40°C~70°C

IEEE 802.11 WLAN Mode Supported:	802.11b 802.11g 802.11n(20MHz channel bandwidth) 802.11ax(20MHz channel bandwidth)
Modulation:	DSSS, OFDM, OFDMA
Operating Frequency Range:	2412-2462MHz
Number of Channels:	11 channels for 802.11b/g/n(20)/ax(20)
Antenna Type:	Integrated Antenna
Antenna Gain:	Ant1: 1.16dBi, Ant2: 1.16dBi (Note: The antenna information is provided by the customers, which will have a certain impact on the test results.)
Smart system:	MIMO

WIFI Type:	UNII-1: 5150MHz-5250MHz Band UNII-2A: 5250MHz-5350MHz Band UNII-2C: 5470MHz-5725MHz Band UNII-3: 5725MHz-5850MHz Band
WLAN Supported:	IEEE 802.11a IEEE 802.11n(20MHz channel bandwidth) IEEE 802.11n(40MHz channel bandwidth) IEEE 802.11ac(20MHz channel bandwidth) IEEE 802.11ac(40MHz channel bandwidth) IEEE 802.11ac(80MHz channel bandwidth) IEEE 802.11ax(20MHz channel bandwidth) IEEE 802.11ax(40MHz channel bandwidth) IEEE 802.11ax(80MHz channel bandwidth)
Frequency Range:	5150MHz-5250MHz Band: 5180-5240MHz for 802.11a 5180-5240MHz for 802.11n(20) 5190-5230MHz for 802.11n(40) 5180-5240MHz for 802.11ac(20) 5190-5230MHz for 802.11ac(40) 5210MHz for 802.11ac(80)

	5180-5240MHz for 802.11ax(20) 5190-5230MHz for 802.11ax(40) 5210MHz for 802.11ax(80)
	5250MHz-5350MHz Band: 5260-5320MHz for 802.11a 5260-5320MHz for 802.11n(20) 5270-5310MHz for 802.11n(40) 5260-5320MHz for 802.11ac(20) 5270-5310MHz for 802.11ac(40) 5290MHz for 802.11ac(80) 5260-5320MHz for 802.11ax(20) 5270-5310MHz for 802.11ax(40) 5290MHz for 802.11ax(80)
	5470MHz-5725MHz Band: 5500-5700MHz for 802.11a 5500-5700MHz for 802.11n(20) 5510-5670MHz for 802.11n(40) 5500-5700MHz for 802.11ac(20) 5510-5670MHz for 802.11ac(40) 5530-5610MHz for 802.11ac(80) 5500-5700MHz for 802.11ax(20) 5510-5670MHz for 802.11ax(40) 5530-5610MHz for 802.11ax(80)
	5725MHz-5850MHz Band: 5745-5825MHz for 802.11a 5745-5825MHz for 802.11n(20) 5755-5795MHz for 802.11n(40) 5745-5825MHz for 802.11ac(20) 5755-5795MHz for 802.11ac(40) 5775MHz for 802.11ac(80) 5745-5825MHz for 802.11ax(20) 5755-5795MHz for 802.11ax(40) 5775MHz for 802.11ax(80)
Modulation:	OFDM/OFDMA
TPC Function:	Support
Beamforming:	Not Support
DFS Function:	Slave
Antenna Type:	Integrated Antenna
Antenna Gain:	Ant1: 3.27dBi, Ant2: 3.27dBi (Note: The antenna information is provided by the customers, which will have a certain impact on the test results.)
Smart System:	MIMO

Operation Band:	LTE B2/B4/B5/B7/B12/B13/B25/B26/B38/B41
Modulation:	UL: QPSK, 16QAM DL: QPSK, 16QAM, 64QAM
Operating Frequency Range(s):	LTE Band 2: Tx: 1850~1910MHz/ Rx:1930~1990MHz LTE Band 4: Tx: 1710~1755MHz/ Rx:2110~2155MHz LTE Band 5: Tx: 824~849MHz/ Rx:869~894MHz LTE Band 7: Tx: 2500~2570MHz/ Rx: 2620~2690MHz LTE Band 12: Tx: 699~716 MHz/ Rx:729~746 MHz LTE Band 13: Tx: 777~787 MHz/ Rx:746~756MHz LTE Band 25: Tx: 1850~1915MHz/ Rx:1930~1995MHz LTE Band 26: Tx: 814~849MHz/ Rx:859~894MHz LTE Band 38: Tx/Rx: 2570~2620MHz LTE Band 41: Tx/Rx:2496~2690MHz
Antenna Type:	Integrated Antenna
Antenna Gain:	LTE Band 2: 0.29dBi LTE Band 4: 1.2dBi LTE Band 5: -0.67dBi LTE Band 7: 2.73dBi LTE Band 12: -3.99dBi LTE Band 13: -2.84dBi LTE Band 25: 0.29dBi LTE Band 26: -0.67dBi LTE Band 38: 2.95dBi LTE Band 41: 3.22dBi (Note: The antenna information is provided by the customers, which will have a certain impact on the test results.)

3. Measurement Result

Mode	Frequency (MHz)	Max Power (dBm)	Antenna gain (dBi)	Antenna Gain Numeric	R (cm)	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
2.4G WIFI	2412	18.75	4.17	2.61	20	0.039	1.0000
5G WIFI	5180	18.16	6.28	4.25	20	0.055	1.0000
LTE Band 2	1860	25	0.29	1.07	20	0.067	1.0000
LTE Band 4	1720	25	1.2	1.32	20	0.083	1.0000
LTE Band 5	829	25	-0.67	0.86	20	0.054	0.5527
LTE Band 7	2510	25	2.73	1.87	20	0.118	1.0000
LTE Band 12	699.7	25	-3.99	0.40	20	0.025	0.4665
LTE Band 13	779.5	25	-2.84	0.52	20	0.033	0.5197
LTE Band 25	1850.7	25	0.29	1.07	20	0.067	1.0000
LTE Band 26	814.7	25	-0.67	0.86	20	0.054	0.5431
LTE Band 38	2580	25	2.95	1.97	20	0.124	1.0000
LTE Band 41	2535	25	3.22	2.10	20	0.132	1.0000

NOTE:

(1) All the modes are tested, only the worst data are described in the table.

(2) 2.4G WIFI: Ant1: 1.16dBi, Ant2: 1.16dBi, Directional gain = 4.17dBi

(3) 5G WIFI: Ant1: 3.27dBi, Ant2: 3.27dBi, Directional gain = 6.28dBi

Conclusion of simultaneous transmitter:

Both of the module 1 and module 2 can transmit simultaneously, the formula of calculated the MPE is:

$CPD1/LPD1 + CPD2/LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Therefore the worst-case situation is $0.055 / 1 + 0.118 / 1 = 0.173$, which is less than 1, this confirmed that the device comply with FCC 1.1310 MPE limit.

----- The End -----