

RF EXPOSURE EVALUATION

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

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)

EUT Specification

FCC ID	Z4T-XIAOESP32S3P
EUT	Seeed Studio XIAO ESP32S3 Plus/Seeed Studio XIAO ESP32S3 Sense Plus
Frequency band (Operating)	<input checked="" type="checkbox"/> BLE: 2.402GHz ~ 2.480GHz <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> RLAN: 5.180GHz ~ 5.240GHz <input type="checkbox"/> RLAN: 5.260GHz ~ 5.320GHz <input type="checkbox"/> RLAN: 5.500GHz ~ 5.700GHz <input type="checkbox"/> RLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others:
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm2) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm2)
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Antenna gain (Max)	BLE/WLAN ANT1: 2.81dBi BLE/WLAN ANT2: 2.9dBi
Evaluation applied	<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 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	Measure d Power	Tune up tolerance	Max. Tune up Power	Max. Tune up Power	Antenna Gain	Antenna Gain in linear	Power density at 20cm	Power density Limits
	(dBm)	(dBm)	(dBm)	(mW)	(dBi)	(Numerical value)	(mW/ cm2)	(mW/cm ²)
BLE ANT1	-1.38	-1.38 ±1	-0.38	0.9162	2.81	1.9099	0.0003	1
BLE ANT2	-1.38	-1.38 ±1	-0.38	0.9162	2.9	1.9498	0.0004	1
WIFI 2.4G ANT1	15.85	15.85 ±1	16.85	48.4172	2.81	1.9099	0.0184	1
WIFI 2.4G ANT1	15.85	15.85 ±1	16.85	48.4172	2.9	1.9498	0.0188	1

BT&WiFi cannot support simultaneous transmission

Result: No Standalone SAR test is required.