RF EXPOSURE EVALUATION

EUT Specification

EUT	IoT-3399E
Frequency band (Operating)	☒WLAN: 2.412GHz ~ 2.462GHz ☒WLAN: 5.18GHz ~ 5.24GHz ☐WLAN: 5.50GHz ~ 5.70GHz ☒WLAN: 5.745GHz ~ 5825GHz ☒Others(Bluetooth: 2.402GHz ~ 2.480GHz)
Device category	☐Portable (<20cm separation) ☒Mobile (>20cm separation) ☐Others ___
Antenna diversity	☐Single antenna ☒Multiple antennas ☐Tx diversity ☐Rx diversity ☐Tx/Rx diversity
Max. output power	12.38 dBm (17.2982mW) for 2.4G WIFI 9.08 dBm (8.0910mW) for 5G WIFI Band1 9.85 dBm (9.6605mW) for 5G WIFI Band4 1.94 dBm (1.5631mW) for BLE 5.745 dBm (3.7540mW) for BT(BDR+EDR)
Antenna gain	3.5 dBi for BT & WIFI
Evaluation applied	☒MPE Evaluation ☐SAR Evaluation

Note: BT function and WIFI(2.4G,5G) function can work simultaneously, but 2.4G WIFI and 5G WIFI can't work simultaneously

Limits for Maximum Permissible Exposure (MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm^2)
300-1500	--	--	**F/1500**
1500-100000	--	--	**1**

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 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.

Measurement Result

Channel	Gain	Channel Frequency (MHz)	Max Output power (dBM)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
Test Mode: BT(BLE)							
Low	3.5	2402	0.63	±0.5	1.2972	0.0006	1
Middle	3.5	2440	1.26	±0.5	1.4997	0.0007	1
High	3.5	2480	1.94	±0.5	1.7539	0.0008	1
Test Mode: BT(BDE+EDR)-GFSK							
Low	3.5	2402	3.701	±0.5	2.6309	0.0012	1
Middle	3.5	2441	5.275	±0.5	3.7801	0.0017	1
High	3.5	2480	5.372	±0.5	3.8654	0.0017	1
Test Mode: BT(BDE+EDR)-π/4-DQPSK							
Low	3.5	2402	3.797	±0.5	2.6897	0.0012	1
Middle	3.5	2441	5.288	±0.5	3.7914	0.0017	1
High	3.5	2480	5.241	±0.5	3.7506	0.0017	1
Test Mode: BT(BDE+EDR)-8DPSK							
Low	3.5	2402	4.270	±0.5	2.9992	0.0013	1
Middle	3.5	2441	5.745	±0.5	4.2121	0.0019	1
High	3.5	2480	5.685	±0.5	4.1543	0.0019	1

Channel	Gain	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
2.4G WIFI							
Test Mode: 802.11b							
Low	3.5	2412	7.49	±0.5	6.2951	0.0028	1
Middle	3.5	2437	7.90	±0.5	6.9183	0.0031	1
High	3.5	2462	8.15	±0.5	7.3282	0.0033	1
Test Mode: 802.11g							
Low	3.5	2412	8.57	±0.5	8.0724	0.0036	1
Middle	3.5	2437	9.00	±0.5	8.9125	0.0040	1
High	3.5	2462	9.41	±0.5	9.7949	0.0044	1
Test Mode: 802.11n(HT20)							
Low	3.5	2412	11.58	±0.5	16.1436	0.0072	1
Middle	3.5	2437	12.25	±0.5	18.8365	0.0084	1
High	3.5	2462	12.38	±0.5	19.4089	0.0086	1

Channel	Gain	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
5G WIFI Band1							
Test Mode: 802.11a							
Low	3.5	5180	8.36	±0.5	7.6913	0.0034	1
Middle	3.5	5200	8.94	±0.5	8.7902	0.0039	1
High	3.5	5240	9.08	±0.5	9.0782	0.0040	1
Test Mode: 802.11n(HT20)							
Low	3.5	5180	7.26	±0.5	5.9704	0.0027	1
Middle	3.5	5200	7.99	±0.5	7.0632	0.0031	1
High	3.5	5240	8.33	±0.5	7.6384	0.0034	1
Test Mode: 802.11ac(VHT20)							
Low	3.5	5180	8.52	±0.5	7.9799	0.0036	1
Middle	3.5	5200	8.25	±0.5	7.4989	0.0033	1
High	3.5	5240	8.69	±0.5	8.2985	0.0037	1
Test Mode: 802.11n(HT40)							
Low	3.5	5190	7.58	±0.5	6.4269	0.0029	1
High	3.5	5230	9.01	±0.5	8.9331	0.0040	1
Test Mode: 802.11ac(VHT40)							
Low	3.5	5190	7.58	±0.5	6.4269	0.0029	1
High	3.5	5230	9.01	±0.5	8.9331	0.0040	1
Test Mode: 802.11ac(VHT80)							
Low	3.5	5210	8.46	±0.5	7.8705	0.0035	1

Channel	Gain	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/ cm^2)	Power density Limits (mW/cm^2)
5G WIFI Band4							
Test Mode: 802.11a							
Low	3.5	5745	5.98	±0.5	4.4463	0.0020	1
Middle	3.5	5785	5.76	±0.5	4.2267	0.0019	1
High	3.5	5825	6.39	±0.5	4.8865	0.0022	1
Test Mode: 802.11n(HT20)							
Low	3.5	5745	9.32	±0.5	9.5940	0.0043	1
Middle	3.5	5785	9.85	±0.5	10.8393	0.0048	1
High	3.5	5825	9.25	±0.5	9.4406	0.0042	1
Test Mode: 802.11ac(VHT20)							
Low	3.5	5745	9.36	±0.5	9.6828	0.0043	1
Middle	3.5	5785	8.93	±0.5	8.7700	0.0039	1
High	3.5	5825	8.79	±0.5	8.4918	0.0038	1
Test Mode: 802.11n(HT40)							
Low	3.5	5755	9.55	±0.5	10.1158	0.0045	1
High	3.5	5795	9.00	±0.5	8.9125	0.0040	1
Test Mode: 802.11ac(VHT40)							
Low	3.5	5755	8.93	±0.5	8.7700	0.0039	1
High	3.5	5795	9.25	±0.5	9.4406	0.0042	1
Test Mode: 802.11ac(VHT80)							
Low	3.5	5775	9.33	±0.5	9.6161	0.0043	1

When bluetooth and WiFi(2.4G) work together:

Power density at 20cm (mW/ cm2) BT	Power density at 20cm (mW/ cm2) 2.4G WIFI	Power density at 20cm (mW/ cm2) Total	Power density Limits (mW/cm^2)
0.0019	0.0086	0.0105	1

When bluetooth and WiFi(5G) work together:

Power density at 20cm (mW/ cm2) BT	Power density at 20cm (mW/ cm2) 5G WIFI	Power density at 20cm (mW/ cm2) Total	Power density Limits (mW/cm^2)
0.0019	0.0048	0.0067	1