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 KDB 447498 D01 V06 and §1.1307(b)
CFR Title 47 §2.1091(b): (b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC ID: **2AT7Z-GMS9218**

EUT Specification

EUT	**Gravio Multi Sensor Gen 1.0**
Frequency band (Operating)	☐WLAN: 2.412GHz ~ 2.462GHz ☐WLAN: 5.18GHz ~ 5.24GHz ☐WLAN: 5.745GHz ~ 5.825GHz ☒Others: 2.405GHz~2.480GHz Zigbee 24.000GHz~24.250GHz Radar
Device category	☐Portable (<20cm separation) ☒Mobile (>20cm separation) ☐Others ___
Exposure classification	☐Occupational/Controlled exposure (S = 5mW/cm2) ☒General Population/Uncontrolled exposure (S=1mW/cm2)
Antenna diversity	☐Single antenna ☒Multiple antennas ☐Tx diversity ☐Rx diversity ☐Tx/Rx diversity
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: Pd=(Pout*G)\(4*pi*R2)

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

Zigbee worst case:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits (mW/cm^2)
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/cm^2)	
Zigbee	2405	-4.71	-4.71±1	-3.71	2	0.0001	1

Radar worst case:

Freq. (MHz)	Field Strength (dBuV/m)	EIRP (dBm)	Turn-up Power (dB)	Power density at 20cm (mW/cm^2)	Power density Limits (mW/cm^2)
24125.000	107.17	11.91	12.00	0.0032	1.0000

Note:

$$E = EIRP - 20\log D + 104.8$$

where:

E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.

EIRP=E-104.8+20logD, D=3

Evaluate the condition of different modules work simultaneously

The requirement of Simultaneous Transmission evaluation has also been considered and has complied with the following conditions of the worst case:

MPE1/Limit1 + MPE2/Limit2 +…… ≤ 1

Thus,

0.0001/1 + 0.0032/1

(Zigbee) (Radar)

= 0.0033 ≤ 1

It is concluded that no Simultaneous Transmission evaluation is required.

Test Result: Pass