FCC RF Exposure Evaluation

1. Product Information

FCC ID:	2AANYIG5	
Product name	Edge computing gateway	
Test Model number	IG502	
Power supply*	9-35Vdc	
Modulation Type	WIFI	802.11b : DSSS 802.11g/n/a/ac : OFDM
	WCDMA	BPSK
	LTE	QPSK, 16QAM
Antenna Type	Suction cup Antenna	
Antenna Gain	For WIFI: Suction cup Antenna with 3dBi gain For WCDMA/LTE: Suction cup Antenna Main antenna: 2.5dBi AUX-Only RX: 2.5dBi	
Hardware version	V11	
Software version	V2.0.0	
FCC Operation frequency	WIFI	2412MHz~2462MHz
	WCDMA	826.4 MHz ~ 846.6 MHz (FOR WCDMA 850) 1712.4 MHz ~ 1752.6 MHz (FOR WCDMA 1700) 1852.4 MHz ~ 1907.6 MHz (FOR WCDMA 1900)
	LTE	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 824 MHz ~ 849 MHz @ Part 22 814 MHz ~ 824 MHz @ Part 90
Exposure category	General population/uncontrolled environment	
EUT Type	Production Unit	

*Note: Pre-scan all voltages, the report only lists the worst voltage DC12V test results.

2. Evaluation method and Limit

According to ANSI/IEEE C95.1-1992, the Criteria Listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	$*900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

The MPE was calculated at **20 cm** to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

Maximum conducted output power (Measured) & Manufacturing tolerance

Specification	Operating Mode	Conducted Output Power (dBm)	Target (dBm)	Tolerance ±(dB)
2.4GWIFI	802.11b	16.23	16	1
	802.11g	14.70	15	1
	802.11n(HT20)	14.41	14	1
	802.11n(HT40)	14.22	14	1
WCDMA	Band II	22.62	23	1
	Band IV	22.85	23	1
	Band V	23.08	23	1
LTE	Band 2	22.87	23	1
	Band 4	22.91	23	1
	Band 5	23.0	23	1
	Band 12	23.16	23	1
	Band 13	23.30	23	1
	Band 25	22.84	23	1
	Band 26	23.44	23	1

According to KDB Publication 447498 D01, Section 7.2
Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0, according to calculated/estimated, numerically modeled, or measured field strengths or power density. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to the MPE limit at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios.

3. Conducted Power

3.1 Test Setup Block Diagram for WWAN

3.2 Test Setup Block Diagram for WLAN

3.3 Test Procedure

WWAN:

1) The EUT was directly connected to the Base Station and antenna output port as show in the Block diagram;

2) Reading average power in RMS detector.

WLAN/RLAN

1) The EUT was directly connected to the spectrum analyser and antenna output port as show in the Block diagram;

2) Reading average power in RMS detector.

3.3 Measurement Equipment

Item	Equipment	Manufacturer	Model No.	Inventory No.	Last Cal.	Next Cal.
1	Base Station	R&S	CMW500	164998	2020-01-05	2022-01-04
2	Spectrum Analyzer	Keysight	N9010A	MY56070788	2020-01-05	2022-01-04

4. Evaluation Results

Collocated WWAN and other Wireless							For FCC	
Band	**Antenna Distance (cm)**	**Antenna Gain in Linear**	**Maximum Power (dBm)**	**Maximum EIRP (dBm)**	**Maximum EIRP (W)**	**Average EIRP (mW)**	**Power Density at 20cm (mW/cm^2)**	**Limit (mW/cm^2)**
WCDMA Band II	20	1.78	24	26.50	0.447	446.68	0.088	1
WCDMA Band IV	20	1.78	24	26.50	0.447	446.68	0.088	1
WCDMA Band V	20	1.78	24	23.65	0.232	446.68	0.088	0.55
LTE Band 2	20	1.78	24	26.50	0.447	446.68	0.088	1
LTE Band 4	20	1.78	24	26.50	0.447	446.68	0.088	1
LTE Band 5	20	1.78	24	23.65	0.232	446.68	0.088	1
LTE Band 12	20	1.78	24	23.65	0.232	446.68	0.088	0.47
LTE Band 13	20	1.78	24	23.65	0.232	446.68	0.088	0.52
LTE Band 25	20	1.78	24	26.50	0.447	446.68	0.088	1
LTE Band 26 @ Part 22	20	1.78	24	23.65	0.232	446.68	0.088	0.55
LTE Band 26 @	20	1.78	24	23.65	0.232	446.68	0.088	0.55

Part 90								
2.4GHz WLAN	20	1.78	17	19.50	0.089	89.13	0.017	1

For WIFI 2.4G and LTE WCDMA can transmit simultaneously, the total evaluation result as below:

Collocated WWAN and other Wireless						For FCC	
No.	Configurations	Maximum MPE Value (mw/cm^2)			Limit	Margin(dB)	PASS/Fail
		WWAN	WLAN	Transmit simultaneously			
3	WCDMA Band 2	0.09	0.02	0.11	1	0.80	PASS
4	WCDMA Band 4	0.09	0.02	0.11	1	0.80	PASS
5	WCDMA Band 5	0.16	0.02	0.18	1	0.67	PASS
6	LTE Band 2	0.09	0.02	0.11	1	0.80	PASS
7	LTE Band 4	0.09	0.02	0.11	1	0.80	PASS
8	LTE Band 5	0.09	0.02	0.11	1	0.80	PASS
9	LTE Band 12	0.19	0.02	0.21	1	0.62	PASS
10	LTE Band 13	0.17	0.02	0.19	1	0.66	PASS
11	LTE Band 25	0.09	0.02	0.11	1	0.80	PASS
12	LTE Band 26@Part 22	0.16	0.02	0.18	1	0.67	PASS
13	LTE Band 26@Part 90	0.16	0.02	0.18	1	0.82	PASS

Remark:
1. Output power including tune up tolerance;
2. The exposure safety distance is 20cm;
3. *EIRP = EPR + 2.15 (dB)*

5. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure.

.....THE END OF REPORT.....