Maximum Permissible Exposure Report

1 PRODUCT INFORMATION

EUT	**:** Wireless Diagnostics Module / Vehicle Communication Interface
Model Number	**:** A104, A30, A30D, A30M
Model Declaration	**:** The diagnostic package functions of the product download are different
Test Model	**:** A104
Power Supply	**:** DC 9V-36V
Hardware version	**:** A104_MB_V0.4_20241218, A104_BT_V0.4_20241218
Software version	**:** 32780

2 EVALUATION METHOD

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.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. 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 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. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3 LIMIT

3.1 Refer evaluation method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	$(180/f^2)$*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

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

4 MPE CALCULATION METHOD

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

5 ANTENNA INFORMATION

Antenna Gain and type refer to Antenna specification

6 CONDUCTED POWER

2.4G Band:
Bluetooth(BDR+EDR)

Test Mode	Antenna	Channel	Result[dBm]
GFSK	Ant1	2402	4.363
		2441	3.934
		2480	2.654
π /4-DQPSK	Ant1	2402	2.939
		2441	2.415
		2480	1.208
8DPSK	Ant1	2402	3.337
		2441	2.874
		2480	1.642

Bluetooth(BLE)

Test Mode	Antenna	Channel	Result[dBm]
BLE_1M	Ant1	2402	4.542
		2440	4.095
		2480	2.806
BLE_2M	Ant1	2402	4.630
		2440	4.271
		2480	3.007

7 MANUFACTURING TOLERANCE

Bluetooth(BDR+EDR)

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	4.5	4.0	3.0
Tolerance ±(dB)	1.0	1.0	1.0
π/4-DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	3.0	2.5	1.5
Tolerance ±(dB)	1.0	1.0	1.0
8-DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	3.5	3.0	2.0
Tolerance ±(dB)	1.0	1.0	1.0

Bluetooth(BLE)

GFSK(1Mbps) (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	4.5	4.1	3.0
Tolerance ±(dB)	1.0	1.0	1.0
GFSK(2Mbps) (Peak)			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	5.0	4.3	3.2
Tolerance ±(dB)	1.0	1.0	1.0

8 MEASUREMENT RESULTS

8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Bluetooth(BDR+EDR)

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
GFSK	5.5	3.548	2.21	1.66	0.00117	1.0000
π/4-DQPSK	4.0	2.512	2.21	1.66	0.00083	1.0000
8-DPSK	4.5	2.818	2.21	1.66	0.00093	1.0000

Bluetooth(BLE)

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
GFSK(1Mbps)	5.5	3.548	2.21	1.66	0.00117	1.0000
GFSK(2Mbps)	6.0	3.981	2.21	1.66	0.00132	1.0000

Remark:
1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

9 CONCLUSION

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

----------THE END OF REPORT----------