Maximum Permissible Exposure Report

Product Information

Product Name	:	Driver Monitoring System
Model Number	:	AIS
Model Difference Declaration	:	N/A
Test Model	:	AIS
Power Supply	:	DC 24V
Hardware version	:	v2.3.1
Software version	:	v1.1.2
Sample ID	:	TZ230204021–1#&TZ230204021–2#
GSM		
GSM FCC Operation Frequency	:	GSM850(UL: 824 – 849 MHz/DL: 869 – 894 MHz) GSM1900(UL: 1850 –1910 MHz/DL: 1930 – 1990 MHz)
Channel Separation	:	0.2MHz
Modulation Technology	:	GMSK,8PSK
Antenna Type And Gain	:	GSM850:5.0 dBi GSM1900:4.9 dBi
E-UTRA		
E-UTRA FCC Operation Frequency	:	FDD Band 2 (UL: 1850 – 1910 MHz/DL: 1930 – 1990 MHz) FDD Band 4 (UL: 1710 – 1755 MHz/DL: 2110 – 2155 MHz) FDD Band 5 (UL: 824 – 849 MHz/DL: 869 – 894 MHz) FDD Band 12(UL: 699 – 716 MHz/DL: 729 – 746 MHz) FDD Band 26 (UL: 814 – 849 MHz/DL: 859 – 894 MHz)
Channel Separation	:	0.1 MHz
Modulation Technology	:	OFDM (BPSK,16QAM, QPSK)
Antenna Type And Gain	:	Internal Antenna FDD Band 2:4.9 dBi FDD Band 4:4.9 dBi FDD Band 5:5.0 dBi FDD Band 12:4.7 dBi FDD Band 26:4.7 dBi

Note 1: Antenna position refer to EUT Photos
Note 2: The above information supplied by the applicant

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

This Product can only use antennas certificated as follows provided by manufacturer;

Antenna Gain and type refer to Product information

6. Conducted Power

The numeric gain (G) of the antenna with a gain specified in dB is determined by
Numeric gain (G)=10^(antenna gain/10)

Band		Burst Tune up Power(dBm)	Division Factors (dB)	Time-Averaged Tune up Power (dBm)
GSM850	GSM	35.000	-9.03	25.97
GSM1900	GSM	32.000	-9.03	22.97

Note:

Division Factors

To average the power, the division factor is as follows:

1Txslot = 1 transmit time slot out of 8 time slots

=> conducted power divided by (8/1) => -9.03 dB

2Txslots = 2 transmit time slots out of 8 time slots

=> conducted power divided by (8/2) => -6.02 dB

3Txslots = 3 transmit time slots out of 8 time slots

=> conducted power divided by (8/3) => -4.26 dB

4Txslots = 4 transmit time slots out of 8 time slots

=> conducted power divided by (8/4) => -3.01 dB

Band	Maximum Conducted Output Power (dBm)	
	(dBm)	(mW)
GSM850	25.970	395.367
GSM1900	22.970	198.153
LTE Band 2	22.000	158.489
LTE Band 4	22.000	158.489
LTE Band 5	22.000	158.489
LTE Band 12	22.000	158.489
LTE Band 26	22.000	158.489
NB-IOT Band 2	22.000	158.489
NB-IOT Band 4	22.000	158.489
NB-IOT Band 5	22.000	158.489
NB-IOT Band 12	22.000	158.489

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.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
GSM850	25.970	395.367	5.0	3.162	0.2489	0.5573
GSM1900	22.970	198.153	4.9	3.090	0.1219	1.0000
LTE Band2	22.000	158.489	4.9	3.090	0.0975	1.0000
LTE Band4	22.000	158.489	4.9	3.090	0.0975	1.0000
LTE Band5	22.000	158.489	5.0	3.162	0.0998	0.5573
LTE Band12	22.000	158.489	4.7	2.951	0.0931	0.4667
LTE Band26	22.000	158.489	4.7	2.951	0.0931	0.5573
NB-IOT Band2	22.000	158.489	4.9	3.090	0.0975	1.0000
NB-IOT Band4	22.000	158.489	4.9	3.090	0.0975	1.0000
NB-IOT Band5	22.000	158.489	5.0	3.162	0.0998	0.5573
NB-IOT Band12	22.000	158.489	4.7	2.951	0.0931	0.4667

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

8.2 Simultaneous Transmission MPE

Not Applicable

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----------