

Maximum Permissible Exposure Report

1. Product Information

Name of EUT	Siren Gateway
Test Model	GKU1001-2G
Modulation Type	GMSK for GSM/GPRS;
Antenna Gain	1.00dBi (max.) For PCS 1900; 1.00dBi (max.) For BT
Hardware version	V1.1
Software version	V1.1
GSM/EDGE/GPRS Operation Frequency Band	PCS1900 /GPRS1900
GSM/EDGE/GPRS	Supported GSM/GPRS
GSM Release Version	R99
GSM/EDGE/GPRS Power Class	PCS1900:Power Class 1
GPRS/EDGE Multislot Class	GPRS: Multi-slot Class 12
GPRS operation mode	Class B
Antenna Type	FPC Antenna for GSM Ceramic Antenna for BT
BT Modulation Type	GFSK (BT V4.1)
Extreme temp. Tolerance	-20°C to +55°C
Extreme vol. Limits	AC100V to AC240V (nominal: AC230V)

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

The EUT can only use antennas certificated as follows provided by manufacturer;

External Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 0	FPC Antenna	600 MHz – 2500 MHz	1.0dBi
Antenna 1	Ceramic Antenna	600 MHz – 2500 MHz	1.0dBi

6. Conducted Power

General Note:

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing, further SAR test reduction and MPE.

<Bluetooth Max. Conducted Power>

Test Mode	Channel	Frequency (MHz)	Max. Conducted Power (dBm)
Bluetooth LE	GFSK	LCH	0.19
		MCH	0.92
		HCH	-0.45

<GSM Max. Conducted Power>

Test Mode	Channel	Frequency (MHz)	Max. Conducted Power (dBm)
PCS 1900	LCH	1850.2	29.39
	MCH	1880.0	29.52
	HCH	1909.8	29.23

7. Manufacturing Tolerance

<Bluetooth>

Test Mode	Channel	Max. Conducted Power (dBm)	ANT Max. Tune Up Power (dBm)
Bluetooth LE	GFSK	LCH	0.19
		MCH	0.92
		HCH	-0.45

<GSM>

Test Mode	Channel	Max. Conducted Power (dBm)	ANT Max. Tune Up Power (dBm)
PCS 1900	LCH	29.39	29.0±1.0
	MCH	29.52	29.0±1.0
	HCH	29.23	29.0±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 100 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=100\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Antenna 0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
PCS 1900	30.00	1000.0000	1.0000	1.2589	0.0003	1.0000

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
BT LE GFSK	1.00	1.2589	1.0000	1.2589	0.2505	1.0000

Remark:

1. Output power including turn-up tolerance;
2. Output power is burst average power;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer;
4. $MPE\ values = PG/4\pi R^2$
5. We choose 1850 MHz for PCS 1900; 2400 MHz for BTLE to calculate MPE limit as higher frequency will have higher MPE limits.

8.2 Simultaneous Transmission MPE

The sample support one RF modular and share difference antennas, and cannot support Simultaneous Transmission no need consider simultaneous transmission.

9. Conclusion

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

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