Maximum Permissible Exposure Report

1. Product Information

FCC ID	:	2AG97-WIZARPOSUPT
EUT	:	Smart POS
Test Model	:	WIZARPOS UPT
Power Supply	:	Input: DC 12-24V For AC Adapter(model: AD65CM240250A): Input: 100-240V~, 50/60Hz, 1.5A Max Output: 24V⎓2.5A 60.0W For AC Adapter(model: ADP-60D24): Input: 100-240V~, 50/60Hz, 1.5A MAX Output: 24V⎓2.5A
Hardware Version	:	1.0.0
Software Version	:	1.0.0
Bluetooth	:	
Frequency Range	:	2402MHz~2480MHz
Channel Number	:	79 channels for Bluetooth V4.1 (DSS) 40 channels for Bluetooth V4.1 (DTS)
Channel Spacing	:	1MHz for Bluetooth V4.1 (DSS) 2MHz for Bluetooth V4.1 (DTS)
Modulation Type	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V4.1(DSS) GFSK for Bluetooth V4.1 (DTS)
Bluetooth Version	:	V4.1
Antenna Description	:	FPC Antenna, 1.59dBi(Max.)
WIFI(2.4G Band)	:	
Frequency Range	:	2412MHz~2462MHz
Channel Number	:	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Channel Spacing	:	5MHz
Modulation Type	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	:	FPC Antenna, 1.59dBi(Max.)
2G	:	
Support Band	:	☒GSM 900 (EU-Band) ☒DCS 1800 (EU-Band) ☒GSM 850 (U.S.-Band) ☒PCS 1900 (U.S.-Band)
Release Version	:	R99
GPRS Class	:	Class 12

EGPRS Class	:	Class 12
Type Of Modulation	:	GMSK for GSM/GPRS; GMSK/8PSK for EGPRS
Antenna Description	:	FPC Antenna -0.67dBi (max.) For GSM 850 1.84dBi (max.) For PCS 1900
3G	:	
Support Band	:	☒ WCDMA Band II (U.S.-Band) ☒ WCDMA Band V (U.S.-Band) ☐ WCDMA Band IV (U.S.-Band) ☒ WCDMA Band I (EU-Band) ☒ WCDMA Band VIII (EU-Band)
Release Version	:	R6
Type Of Modulation	:	QPSK, 16QAM
Antenna Description	:	FPC Antenna 1.84dBi (max.) For WCDMA Band II -0.67dBi (max.) For WCDMA Band V
LTE	:	
Support Band	:	☒ E-UTRA Band 2(U.S.-Band) ☒ E-UTRA Band 4(U.S.-Band) ☒ E-UTRA Band 5(U.S.-Band) ☒ E-UTRA Band 7(U.S.-Band) ☒ E-UTRA Band 38(U.S.-Band) ☒ E-UTRA Band 41(U.S.-Band)
LTE Release Version	:	R9
Type Of Modulation	:	QPSK/16QAM
Antenna Description	:	FPC Antenna 1.84dBi (max.) For E-UTRA Band 2 1.66dBi (max.) For E-UTRA Band 4 -0.67dBi (max.) For E-UTRA Band 5 1.82dBi (max.) For E-UTRA Band 7 1.91dBi (max.) For E-UTRA Band 38 1.91dBi (max.) For E-UTRA Band 41
Power Class	:	Class 3
NFC	:	
Operating Frequency	:	13.56MHz
Modulation Type	:	ASK
Antenna Description	:	Coil Antenna, 0.5dBi(Max.)
GPS function	:	Support and only RX
Extreme temp. Tolerance	:	-30°C to +50°C

Extreme vol. Limits	:	21.6VDC to 26.4VDC (nominal: 24VDC)
EUT Type	:	Production Unit
Device Type	:	Mobile Device

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 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Antenna	FPC Antenna	2400 MHz – 2500 MHz	1.59dBi	BT WIFI Antenna
Antenna	FPC Antenna	600 MHz – 3000 MHz	-0.67dBi (max.) For GSM 850 1.84dBi (max.) For PCS 1900 1.84dBi (max.) For WCDMA Band II -0.35dBi (max.) For WCDMA Band V 1.84dBi (max.) For E-UTRA Band 2 1.66dBi (max.) For E-UTRA Band 4 -0.67dBi (max.) For E-UTRA Band 5 1.82dBi (max.) For E-UTRA Band 7 1.91dBi (max.) For E-UTRA Band 38 1.91dBi (max.) For E-UTRA Band 41	GSM/WCDMA/LTE Antenna

6. Conducted Power and Manufacturing Tolerance

[BT Max Conducted Power]

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)	**ANT Max. Tune Up Power (dBm)**
GFSK	0	2402	3.86	3.0±1.0
	39	2441	2.76	2.0±1.0
	78	2480	1.54	1.0±1.0
π/4DQPSK	0	2402	3.26	3.0±1.0
	39	2441	1.83	1.0±1.0
	78	2480	1.53	1.0±1.0
8DPSK	0	2402	3.23	3.0±1.0
	39	2441	3.36	3.0±1.0
	78	2480	1.55	1.0±1.0

<BT LE>

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)	**ANT Max. Tune Up Power (dBm)**
GFSK	0	2402	-1.42	-1.0±1.0
	19	2440	-1.22	-1.0±1.0
	39	2480	-1.31	-1.0±1.0

[2.4GWLAN Max Conducted Power]

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)	**ANT Max. Tune Up Power (dBm)**
IEEE 802.11b	1	2412	16.12	16.0±1.0
	6	2437	16.10	16.0±1.0
	11	2462	15.90	15.0±1.0
IEEE 802.11g	1	2412	15.63	15.0±1.0
	6	2437	15.44	15.0±1.0
	11	2462	15.36	15.0±1.0
IEEE 802.11n HT20	1	2412	14.66	14.0±1.0
	6	2437	14.41	14.0±1.0
	11	2462	14.30	14.0±1.0
IEEE 802.11n HT40	3	2422	14.10	14.0±1.0
	6	2437	14.84	14.0±1.0
	9	2452	14.85	14.0±1.0

[GSM Max Average Power]

Test Mode	**Channel**	**Frequency (MHz)**	**Max Average Power (dBm)**	**ANT Max. Tune Up Power (dBm)**
GSM 850	Low	824.2	32.70	32.0±1.0
	Middle	836.6	32.73	32.0±1.0
	High	848.8	32.66	32.0±1.0
GSM 1900	Low	1850.2	29.66	29.0±1.0
	Middle	1880.0	29.70	29.0±1.0
	High	1909.8	29.67	29.0±1.0

[WCDMA Max Average Power]

Test Mode	**Channel**	**Frequency (MHz)**	**Max Average Power (dBm)**	**ANT Max. Tune Up Power (dBm)**
WCDMA Band II	Low	1852.4	23.49	23.0±1.0
	Middle	1880	23.56	23.0±1.0
	High	1907.6	23.57	23.0±1.0
WCDMA Band V	Low	1712.4	23.39	23.0±1.0
	Middle	1732.6	23.46	23.0±1.0
	High	1752.6	23.54	23.0±1.0

[LTE Max Average Power]

Test Mode		Channel	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
LTE	Band 2	LCH	22.77	22.0±1.0
		MCH	22.76	22.0±1.0
		HCH	22.72	22.0±1.0
	Band 4	LCH	22.97	22.0±1.0
		MCH	22.78	22.0±1.0
		HCH	22.34	22.0±1.0
	Band 5	LCH	23.44	23.0±1.0
		MCH	23.52	23.0±1.0
		HCH	23.27	23.0±1.0
	Band 7	LCH	22.84	22.0±1.0
		MCH	23.10	23.0±1.0
		HCH	23.40	23.0±1.0
	Band 38	LCH	22.56	22.0±1.0
		MCH	22.54	22.0±1.0
		HCH	22.81	22.0±1.0
	Band 41	LCH	22.21	22.0±1.0
		MCH	22.59	22.0±1.0
		HCH	22.98	22.0±1.0

7. Measurement Results

7.1 Standalone MPE Evaluation

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.

[BT]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)	MPE ratios
	dBm	mW					
GFSK	4.00	2.5119	1.59	1.4421	0.0007	1.0000	0.0007
π/4DQPSK	4.00	2.5119	1.59	1.4421	0.0007	1.0000	0.0007
8DPSK	4.00	2.5119	1.59	1.4421	0.0007	1.0000	0.0007

[BT LE]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)	MPE ratios
	dBm	mW					
GFSK	0	1.0000	1.59	1.4421	0.0003	1.0000	0.0003

[2.4GWIFI]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)	MPE ratios
	dBm	mW					
IEEE 802.11b	17.00	50.1187	1.59	1.4421	0.0144	1.0000	0.0144
IEEE 802.11g	16.00	39.8107	1.59	1.4421	0.0114	1.0000	0.0114
IEEE 802.11n HT20	15.00	31.6228	1.59	1.4421	0.0091	1.0000	0.0091
IEEE 802.11n HT40	15.00	31.6228	1.59	1.4421	0.0091	1.0000	0.0091

[GSM]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)	MPE ratios
	dBm	mW					
GSM 850	33.00	1995.2623	-0.67	0.8570	0.3402	0.5493	0.6193
GSM 1900	30.00	1000.0000	1.84	1.5276	0.3039	1.0000	0.3039

[WCDMA]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)	MPE ratios
	dBm	mW					
WCDMA Band II	24.00	251.1886	1.84	1.5276	0.0763	1.0000	0.0763
WCDMA Band V	24.00	251.1886	-0.67	0.8570	0.0428	0.5493	0.0779

[LTE]

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)	MPE ratios
	dBm	mW					
LTE Band 2	23.00	199.5262	1.84	1.5276	0.0606	1.0000	0.0606
LTE Band 4	23.00	199.5262	1.66	1.4655	0.0582	1.0000	0.0582
LTE Band 5	24.00	251.1886	-0.67	0.8570	0.0428	0.5493	0.0779
LTE Band 7	24.00	251.1886	1.82	1.5205	0.0760	1.0000	0.0760
LTE Band 38	23.00	199.5262	1.91	1.5524	0.0616	1.0000	0.0616
LTE Band 41	23.00	199.5262	1.91	1.5524	0.0616	1.0000	0.0616

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 = $PG/4\pi R^2$

7.2 Simultaneous Transmission MPE

The sample support one BT&2.4GWLAN, another one LTE&WCDMA&GSM transmit antenna, so need consider simultaneous transmission;
Simultaneous transmission MPE
According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
∑∑of MPE ratios ≤ 1.0

Mode	MPE_1 ratios Max.	MPE_2 ratios Max.	∑ MPE ratios	Limit	Results
BT+GSM	0.0007	0.6193	0.6200	1.000	Pass
2.4GWIFI+GSM	0.0144	0.6193	0.6337	1.000	Pass
BT+WCDMA	0.0007	0.0779	0.0786	1.000	Pass
2.4GWIFI+WCDMA	0.0144	0.0779	0.0923	1.000	Pass
BT+LTE	0.0007	0.0779	0.0786	1.000	Pass
2.4GWIFI+LTE	0.0144	0.0779	0.0923	1.000	Pass

8. 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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