Maximum Permissible Exposure Report

1. Product Information

FCCID	:	2ALZEUSF5
EUT	:	Cell Phone Signal Booster
Equipment Type	:	Fixed Wideband Consumer Signal Booster
Test Model	:	AN-USF5-01
Power Supply	:	For AC Adapter(model: SSK0500200U1070-B): Input: AC 100-240V,50/60Hz, 0.35A Output: DC 5V⎓ 2.0A, 10W
Hardware Version	:	AN-USF5-01 V1.0
Software Version	:	AN-USF5-01 V1.0
Frequency Range	:	Lower 700MHz Band(B12) Uplink: 698~716MHz, Downlink: 728~746 MHz Upper 700MHz Band(B13) Uplink: 776~787MHz, Downlink: 746~757 MHz Cellular Band(B5) Uplink: 824~849MHz, Downlink: 869~894 MHz PCS Band(B2) Uplink: 1850~1910MHz, Downlink: 1930~1990 MHz AWS Band(B4) Uplink: 1710~1755MHz, Downlink: 2110~2155 MHz
Max. Antenna Port Output power	:	Uplink: ≤20dBm Downlink: ≤8dBm
Emission Designator	:	F9W, G7D, G7W, GXW, W7D
FCC Classification	:	B2W/Wideband Consumer Booster(CMRS)
Bluetooth	:	
Frequency Range	:	2402MHz ~ 2480MHz
Channel Number	:	40 channels for Bluetooth V4.0(DTS)
Channel Spacing	:	2MHz for Bluetooth V4.0(DTS)
Modulation Type	:	GFSK for Bluetooth V4.0(DTS)
Bluetooth Version	:	V4.0
Antenna Description	:	PCB Antenna, 0dBi(Max.)
Operating Temperature	:	-25ºC~+55ºC
Exposure category	:	General population/uncontrolled environment
Device Type	:	fixed Device

Antenna Information:

External Antenna for B2W function can only use antennas certificated as follows provided by manufacturer:

/	Frequency(MHz)	Antenna Gain(dBi)			Cable loss(dB) (PTE-3D-FB-10NB)
		YAgi Antenna (model: PTE-YG-800/1900)	LPDA Antenna (model: AN-201)	Omni directional glass fiber Antenna (model: PTE-GF-700-2500)	
Outdoor	Lower 700MHz	8	6	3	5.21
	Upper 700MHz	8	6	3	5.21
	Cellular	8	6	3	5.49
	PCS	10	8	5	6.25
	AWS	10	8	5	5.89
/	Frequency(MHz)	Rubber Antenna (model: PTE-RB-800-2100)	Ceiling Antenna (model: PTE-CI-800-2500)	Indoor Panel Antenna (model: AN-101)	Cable loss(dB) (PTE-3D-FB-5NB)
Indoor	Lower 700MHz	3	3	6	2.19
	Upper 700MHz	3	3	6	2.19
	Cellular	3	3	6	2.29
	PCS	3.5	4.5	8	2.55
	AWS	3.5	4.5	8	2.86

For Bluetooth LE function:

Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
PCB Antenna	2400MHz ~ 2500MHz	0dBi	BT Antenna

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. Conducted Output Power

Operation Bands	Frequency (MHz)	Max. Output Power (dBm)	Cable Loss	Power to Antenna (mW)
UL (1850~1910MHz)	1880.0	18.89	6.25	18.37
UL(1710~1755MHz)	1732.5	19.67	5.89	23.88
UL(824~849MHz)	836.5	19.81	5.49	27.04
UL(698~716MHz)	707.0	18.87	5.21	23.23
UL(776~787MHz)	781.5	19.63	5.21	27.67
DL(1930~1990 MHz)	1960.0	7.05	2.55	2.82
DL(2110~2155 MHz)	2132.5	7.18	2.86	2.70
DL(869~894 MHz)	881.5	7.36	2.29	3.21
DL(728~746 MHz)	737.0	7.01	2.19	3.03
DL(746~757 MHz)	751.5	7.25	2.19	3.21
Bluetooth LE	2480	-3.93	/	0.40

6. Measurement Results

Operation Bands	Frequency (MHz)	Power to Antenna (dBm)	Target (dBm)	Tolerance ±(dB)
UL (1850~1910MHz)	1880.0	12.64	13.0	1.0
UL(1710~1755MHz)	1732.5	13.78	13.0	1.0
UL(824~849MHz)	836.5	14.32	14.0	1.0
UL(698~716MHz)	707.0	13.66	13.0	1.0
UL(776~787MHz)	781.5	14.42	14.0	1.0
DL(1930~1990 MHz)	1960.0	4.50	5.0	1.0
DL(2110~2155 MHz)	2132.5	4.32	5.0	1.0
DL(869~894 MHz)	881.5	5.07	5.0	1.0
DL(728~746 MHz)	737.0	4.82	5.0	1.0
DL(746~757 MHz)	751.5	5.06	6.0	1.0
Bluetooth LE	2480	-3.93	-3.0	1.0

7. Limits for General /Uncontrolled Exposure

7.1 Maximum permissible exposure :

the report recorded the worst result of Outdoor Antenna（PTE-YG-800/1900), Indoor Antenna(AN-101) for B2W function

Band/Mode	RF output power		Antenna Gain (dBi)	MPE (mW/cm2)	MPE Limits (mW/cm2)	MPE ratios	Results
	dBm	mW					
UL (1850~1910MHz)	14.0	25.1189	10	0.0500	1.0	0.0500	PASS
UL(1710~1755MHz)	14.0	25.1189	10	0.0500	1.0	0.0500	PASS
UL(824~849MHz)	15.0	31.6228	8.0	0.0397	0.56	0.0709	PASS
UL(698~716MHz)	14.0	25.1189	8.0	0.0315	0.47	0.0670	PASS
UL(776~787MHz)	15.0	31.6228	8.0	0.0397	0.52	0.0763	PASS
DL(1930~1990 MHz)	6.0	3.9811	8.0	0.0050	1.0	0.0050	PASS
DL(2110~2155 MHz)	6.0	3.9811	8.0	0.0050	1.0	0.0050	PASS
DL(869~894 MHz)	6.0	3.9811	6.0	0.0032	0.59	0.0054	PASS
DL(728~746 MHz)	6.0	3.9811	6.0	0.0032	0.49	0.0065	PASS
DL(746~757 MHz)	7.0	5.0119	6.0	0.0040	0.50	0.0080	PASS
Bluetooth LE	-2.0	0.6310	0	0.0001	1.0	0.0001	PASS

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 EUT equiped with one BLE antenna, and B2W 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	BT MPE ratios	B2W MPE ratios	∑ MPE ratios	Limit	Results
BLE+B2W	0.0001	0.0763	0.0764	1.0	Pass

8. Evaluation Results

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.

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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