Maximum Permissible Exposure Report

1. Product Information

FCC ID	:	2AJAN-SMH100
EUT	:	Hero 100 DAS
Equipment Type	:	Industrial Signal Booster
Test Model	:	SMH100
Additional Models No		SMHW100
Models Declaration		PCB board,same design and work diagrams of these model(s) are the same, So no additional models were tested.
Power Supply	:	For AC Adapter: Input: AC 100-240V,50/60Hz, 2.0A Output: DC 12V⎓ 3.0A,36W
Hardware Version	:	LL17C-Wireless-V01
Software Version	:	LL17C-Wireless-V01.HEX
Frequency Range	:	Band 12:Uplink:698-716 Downlink:728-746 Band 14:Uplink:788-798 Downlink:758-768
Antenna Type	:	Outdoor: Yagi antenna,Outdoor Panel Antenna Indoor: Indoor Omni Antenna,Indoor Panel Antenna
Antenna Gain	:	Outdoor: 9.5dBi (Max.) Indoor: 7.0dBi (Max.)
Operating Temperature	:	-25ºC~+55ºC
Exposure category	:	General population/uncontrolled environment
EUT Type	:	Production Unit
Device Type	:	fixed 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/cm²)	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/cm²)	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

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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 and Conducted Output Power

Hero 100 DAS can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Outdoor Antenna	SYN-BY-9D	698 MHz –2700 MHz	9.5 dBi	Antenna for Band 12/Band 14
Indoor Antenna	SYN-IPA-8D	698 MHz –2700 MHz	7 .0 dBi	Antenna for Band 12/Band 14
Outdoor Antenna	SYN-OPA-8D	698 MHz –2700 MHz	7.0 dBi	Antenna for Band 12/Band 14
Indoor Antenna	SYN-CA-3D	698 MHz –2700 MHz	3.0 dBi	Antenna for Band 12/Band 14

Band 12

Mode	Frequency (MHz)	Signal Type	AGC threshold level (dBm)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Cable Loss	Output Power-CableLoss
Uplink	707.63	AWGN	-24.08	Pre-AGC	-25.940	24.420	50.360	0.8	23.62
				3dB above AGC	-22.940	24.510	47.450	0.8	**23.71**
		GSM	-25.02	Pre-AGC	-24.941	23.510	48.451	1.7	21.81
				3dB above AGC	-21.941	23.953	45.894	1.7	22.25
Downlink	739.56	AWGN	-41.5	Pre-AGC	-42.600	9.520	52.120	0.8	8.72
				3dB above AGC	-39.600	9.530	49.130	0.8	**8.73**
		GSM	-41.0	Pre-AGC	-41.071	9.253	50.324	1.7	7.55
				3dB above AGC	-38.071	10.075	48.146	1.7	8.38

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Band 14

Mode	Frequency (MHz)	Signal Type	AGC threshold level (dBm)	Signal Level	Input Power (dBm)	Output Power (dBm)	Gain (dB)	Result	Cable Loss	Output Power-CableLoss
Uplink	788.24	CW	-24.5	Pre-AGC	-24.536	21.547	46.083	Pass	0.8	**20.747**
				3dB above AGC	-21.569	21.141	42.71	Pass	0.8	20.341
Downlink	758.18	CW	-44.3	Pre-AGC	-44.310	5.661	49.971	Pass	1.8	**4.131**
				3dB above AGC	-41.456	5.329	46.785	Pass	1.8	3.829

6. Measurement Results

Band 12

Uplink（AWAG Signal）			
Channel	Low Channel	Middle Channel	High Channel
Target (dBm)	23.0	24.0	23.0
Tolerance ±(dB)	1.0	1.0	1.0
Downlink			
Channel	Low Channel	Middle Channel	High Channel
Target (dBm)	8.0	8.0	8.0
Tolerance ±(dB)	1.0	1.0	1.0

Band 14

Uplink（CW Signal）			
Channel	Low Channel	Middle Channel	High Channel
Target (dBm)	20.0	20.0	20.0
Tolerance ±(dB)	1.0	1.0	1.0
Downlink			
Channel	Low Channel	Middle Channel	High Channel
Target (dBm)	3.0	4.0	3.0
Tolerance ±(dB)	1.0	1.0	1.0

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7. Limits for General /Uncontrolled Exposure

Maximum permissible exposure :

For Outdoor Antenna（SYN-BY-9D),Indoor Antenna(SYN-IPA-8D);Outdoor Antenna（SYN-OPA-8D),Indoor Antenna(SYN-CA-3D) were estimated ,the report recorded the worst result of Outdoor Antenna（SYN-BY-9D),Indoor Antenna(SYN-IPA-8D)

Band 12

Band/Mode	RF output power		Antenna Gain (dBi)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW			
Uplink	25.0	316.2278	7.0	0.3153	0.465
Downlink	9.0	7.9433	9.5	0.0141	0.485

Band 14

Band/Mode	RF output power		Antenna Gain (dBi)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW			
Uplink	21.0	31.6228	7.0	0.1255	0.525
Downlink	5.0	3.1623	9.5	0.0056	0.505

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 = $PG/4\pi R^2$

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.

Simultaneous Transmission MPE

Not 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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