

RF Exposure Evaluation Report

Report Reference No......: **MTEB23090094-H**
FCC ID..... : **2A397-HK316K**

Compiled by

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Date of issue.....: **September.12,2023**
Representative Laboratory Name..: **Shenzhen Most Technology Service Co., Ltd.**

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Applicant's name.....: **QINGDAO HISTONE INTELLIGENT COMMERCIAL SYSTEM CO., LTD.**

 Address: Wisdom Valley, No.8 Shengshui Road, Laoshan District, Qingdao
 City, China

Test specification/ Standard: **47 CFR Part 1.1307;47 CFR Part 1.1310**
KDB447498D01 General RF Exposure Guidance v06

TRF Originator.....: Shenzhen Most Technology Service Co., Ltd.

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Test item description: POS COMPUTER

Trade Mark: Histone

 Manufacturer: QINGDAO HISTONE INTELLIGENT COMMERCIAL SYSTEM CO.,
 LTD.

Model/Type reference.....: HK316K

Listed Models: HK316 3568,HK316

 Modulation Type: GFSK
 CCK/DSSS/ OFDM
 GFSK, $\pi/4$ DQPSK, 8DPSK
 OFDM
 ASK

 Operation Frequency.....: From 2402MHz to 2480MHz
 From 2412 - 2462MHz
 From 2402MHz to 2480MHz
 From 5180MHz-5240MHz; 5745MHz-5825MHz
 13.56MHz

Hardware Version.....: AloT-3568

Software Version: HK316_3568

Rating	DC 24V (by Adapter)
Result.....	PASS

TEST REPORT

Equipment under Test : POS COMPUTER

Model /Type : HK316K

Listed Models HK316 3568,HK316

Remark All models are identical to each other, except model name.

Applicant : QINGDAO HISTONE INTELLIGENT COMMERCIAL SYSTEM CO., LTD.

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Test Result:	PASS
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

1. Revision History

Revision	Issue Date	Revisions	Revised By
00	2023-09-12	Initial Issue	Alisa Luo

2. SAR Evaluation

2.1 RF Exposure Compliance Requirement

2.1.1 Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v06

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

2.1.2 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	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

Friis Formula

Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$ Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.1.3 EUT RF Exposure

Antenna Gain: 4.54dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 in linear scale. Output Power Into Antenna & RF Exposure Evaluation Distance:

BLE

GFSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	2.736	2.736 ± 1	3.736
Middle(2440MHz)	3.608	3.608 ± 1	4.608
Highest(2480MHz)	3.818	3.818 ± 1	4.818

Worst case: GFSK						
Channel	Maximum Peak Conducted Output Power (dBm)	Maximum Peak Conducted Output Power (MW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Highest(2480 MHz)	4.608	2.89	4.54	0.0016	1.0	Pass

Note: 1) Refer to report **MTEB23090094-R1** for EUT test Maximum tune-up Power.Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (2.89 \cdot 2.84) / (4 \cdot 3.1416 \cdot 20^2) = 0.0016$

Note: 3) EUT's Bluetooth module is more than 20cm away from the human body.

Antenna Gain: 4.54dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 in linear scale. Output Power Into Antenna & RF Exposure Evaluation Distance:

BT classic

GFSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	3.154	3.154 ± 1	4.154
Middle(2441MHz)	0.807	0.807 ± 1	1.807
Highest(2480MHz)	-5.323	-5.323 ± 1	-4.323

$\pi/4$ DQPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	2.104	2.104 ± 1	3.104
Middle(2441MHz)	-0.064	-0.064 ± 1	0.936
Highest(2480MHz)	-5.990	-5.990 ± 1	-4.990

8DPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	2.103	2.103 ± 1	3.103
Middle(2441MHz)	-0.015	-0.015 ± 1	0.985
Highest(2480MHz)	-6.022	-6.022 ± 1	-5.022

Worst case: GFSK						
Channel	Maximum Peak Conducted Output Power (dBm)	Maximum Peak Conducted Output Power (MW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Highest(2480 MHz)	4.154	2.60	4.54	0.001	1.0	Pass

Note: 1) Refer to report **MTEB23090094-R2** for EUT test Maximum tune-up Power.

Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (2.60 \cdot 2.84) / (4 \cdot 3.1416 \cdot 20^2) = 0.001$

Note: 3) EUT's Bluetooth module is more than 20cm away from the human body.

Antenna Gain : 4.54dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 in linear scale. Output Power Into Antenna & RF Exposure Evaluation Distance:

WIFI 2.4G

802.11b			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2412MHz)	17.77	17.77 ± 1	18.77
Middle(2437MHz)	18.27	18.27 ± 1	19.27
Highest(2462MHz)	18.65	18.65 ± 1	19.65

802.11g			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2412MHz)	18.22	18.22 ± 1	19.22
Middle(2437MHz)	18.70	18.70 ± 1	19.20
Highest(2462MHz)	18.96	18.96 ± 1	19.96

802.11n(H20)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2412MHz)	18.13	18.13 ± 1	19.13
Middle(2437MHz)	18.48	18.48 ± 1	19.48
Highest(2462MHz)	18.89	18.89 ± 1	18.89

WIFI 2.4G

Worst case: 802.11g						
Channel	Maximum tune-up Power (dBm)	Maximum tune-up Power (MW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Middle(2437MHz)	19.96	99.08	4.54	0.05	1.0	Pass

Note: 1) Refer to report **MTEB23090094-R3** for EUT test Maximum tune-up Power.

Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (99.08 \cdot 2.84) / (4 \cdot 3.1416 \cdot 20^2) = 0.05$

Note: 3) EUT's Bluetooth module is more than 20cm away from the human body.

Antenna Gain : 3.48dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 in linear scale. Output Power Into Antenna & RF Exposure Evaluation Distance:

WIFI 5G

IEEE for 802.11a			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
149	3.19	3.19±1	4.19
157	4.67	4.67±1	5.67
165	4.01	4.01± 1	5.01

IEEE for 802.11n(HT20)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
149	3.24	3.24±1	4.24
157	4.58	4.58 ±1	5.58
165	3.63	3.63±1	4.63

IEEE for 802.11n(HT40)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
151	3.65	3.65±1	4.65
159	4.99	4.99±1	5.99

IEEE for 802.11ac(HT20)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
149	3.42	3.42±1	4.42
157	4.59	4.59±1	5.59
165	7.86	7.86±1	8.86

IEEE for 802.11 ac(HT40)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
151	3.79	3.79±1	4.79
159	5.02	5.02 ±1	5.02

IEEE for 802.11ac(HT80)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
155	8.57	8.57±1	9.57

Worst case: IEEE for 802.11 ac(HT40)						
Channel	Maximum Peak Conducted Output Power	Maximum Peak Conducted Output Power	Antenna Gain	Power Density at R = 20 cm	Limit	Result
	(dBm)	(MW)		(mW/cm ²)		
Lowest (5755MHz)	9.57	9.06	3.48	0.004	1.0	Pass

Note: 1) Refer to report **MTEB23090094-R4** for EUT test Maximum tune-up Power.

Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (9.06 \cdot 2.23) / (4 \cdot 3.1416 \cdot 20^2) = 0.004$

Note: 3) EUT's Bluetooth module is more than 20cm away from the human body.

NFC:

The worst case (refer to report **MTEB23090094-R5**) is below:

Antenna polarization: Horizontal		
Frequency (MHz)	Level (dBuV/m)	Polarization
13.56	77.9	Peak

$$E = \text{EIRP} - 20 \log d + 104.8$$

E: is the electric field strength in dBuV/m

EIRP: is the equivalent isotropically radiated power in dBm

d: is the specified measurement distance in m

d=3m

$$\text{EIRP} = 77.9 + 20 \log 3 - 104.8 = -17.30 \text{ dBm}$$

13.56 MHz < 30 MHz, Add a 6 dB maximum ground factor.

$$\text{EIRP} = -17.30 \text{ dBm} + 6 = -11.3 \text{ dBm}$$

The EIPR of the product is small enough, RF Exposure meets the requirements.

.....**THE END OF REPORT**.....