

RF Exposure Evaluation Report

Report Reference No.....: MTEB23040077-H

FCC ID.....: 2A4WZ-WS01M1

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Representative Laboratory Name.: Shenzhen Most Technology Service Co., Ltd.

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Applicant's name.....: ENGINE TECHNOLOGY LIMITED

Address: No.2, Hangtian South Road, Longquanyi District, Chengdu City, Sichuan Province

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: ULTRA SHORT FOCAL INTELLIGENT PROJECTOR

Trade Mark:  WITSEER

Manufacturer: ENGINE TECHNOLOGY LIMITED

Model/Type reference: WS01-M10

Listed Models: WS01-M11,WS01-M12

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

Operation Frequency.....: GFSK, $\pi/4$ DQPSK, 8DPSK: From 2402 - 2480MHz
CCK/DSSS/ OFDM :From 2412 - 2462MHz
OFDM:5180MHz-5240MHz

Rating: DC 19V by Adapter
(Input: AC 100-240V~50/60Hz 1.8A
Output: DC 19V=4.7A MAX)

Hardware version: P9_MAIN_V2.X

Software version: 2.X.X.X_XXXXXXXXX

Result: **PASS**

TEST REPORT

Equipment under Test : ULTRA SHORT FOCAL INTELLIGENT PROJECTOR

Model /Type : WS01-M10

Listed Models : WS01-M11,WS01-M12

Remark : Only the appearance color and outer packaging are different.

Applicant : ENGINE TECHNOLOGY LIMITED

Address : No.2, Hangtian South Road, Longquanyi District, Chengdu City,
Sichuan Province

Manufacturer : ENGINE TECHNOLOGY LIMITED

Address : No.2, Hangtian South Road, Longquanyi District, Chengdu City,
Sichuan Province

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	2023.04.14	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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$ 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: 2.55dBi

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(2412 MHz)	17.51	17.51 ± 1	18.51
Middle(2437MHz)	17.88	17.88 ± 1	18.88
Highest(2462MHz)	16.16	16.16 ± 1	17.16

802.11g			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2412 MHz)	15.13	15.13 ± 1	16.13
Middle(2437MHz)	15.84	15.84 ± 1	16.84
Highest(2462MHz)	13.16	13.16 ± 1	14.16

802.11n(HT20)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2412 MHz)	14.12	14.12 ± 1	15.12
Middle(2437MHz)	15.22	15.22 ± 1	16.22
Highest(2462MHz)	12.57	12.57 ± 1	13.57

WIFI

Worst case: 802.11n(HT20)						
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(2412 MHz)	18.88	77.26	2.55	0.026	1.0	Pass

Note: 1) Refer to report **MTEB23040077-R2** for EUT test Max Conducted average Output Power value.

Note: 2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (77.26 * 1.79) / (4 * 3.1416 * 20^2) = 0.027$

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

BT classic

GFSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	-2.517	-2.517 ± 1	-1.517
Middle(2441MHz)	-1.756	-1.756 ± 1	-0.756
Highest(2480MHz)	-1.552	-1.552 ± 1	-0.552

π /4DQPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	-1.502	-1.502 ± 1	-0.502
Middle(2441MHz)	-0.813	-0.813 ± 1	0.187
Highest(2480MHz)	-0.670	-0.670 ± 1	0.330

8DPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	-1.069	-1.069 ± 1	-0.069
Middle(2441MHz)	-0.377	-0.377 ± 1	0.623
Highest(2480MHz)	-0.253	-0.253 ± 1	0.747

Worst case: 8DPSK						
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(2441 MHz)	0.623	1.15	2.55	0.0004	1.0	Pass

Note: 1) Refer to report **MTEB23040077-R1** for EUT test Max Conducted average Output Power value.

Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (1.15 \cdot 1.79) / (4 \cdot 3.1416 \cdot 20^2) = 0.0004$

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

WIFI 5G

IEEE for 802.11a			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
36	12.30	12.30 ± 1	13.30
40	11.82	11.82 ± 1	12.82
48	12.58	12.58 ± 1	13.58

IEEE for 802.11n(HT20)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
36	13.36	13.36 ± 1	14.36
40	13.30	13.30 ± 1	14.30
48	15.20	15.20 ± 1	16.20

IEEE for 802.11n(HT40)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
38	15.30	15.30 ± 1	16.30
46	15.01	15.01 ± 1	16.01

IEEE for 802.11ac(HT20)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
36	14.30	14.30 ± 1	15.30
40	13.55	13.55 ± 1	13.55
48	15.41	15.41 ± 1	15.41

IEEE for 802.11ac(HT40)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
38	14.01	14.01 ± 1	15.01
46	13.30	13.30 ± 1	14.30

IEEE for 802.11ac(HT80)			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
42	13.59	13.59±1	14.59

Worst case: IEEE for 802.11a						
Channel	Maximum Peak Conducted Output Power	Maximum Peak Conducted Output Power	Antenna Gain	Power Density at R = 20 cm	Limit	Result
	(dBm)	(MW)	(dBi)	(mW/cm ²)		
Lowest (5180MHz)	16.30	42.65	2.71	0.0015	1.0	Pass

Note: 1) Refer to report MTEB22120172-R3 for EUT test Max Conducted average Output Power value.

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