Maximum Permissible Exposure Evaluation

FCC ID: 2AHAS-BT82D

Report No.	:	TBR-C-202502-0188-3
Applicant	:	JEM ACCESSORIES, INC
Equipment Under Test (EUT)		
EUT Name	:	Bluetooth FM Transmitter
Model No.	:	BT82D
Series Model No.	:	BT82DF, AHF9-1010-BLK, MCC9-1032-BLK
Brand Name	:	ArmorAll & Monster
Sample ID	:	HC-C-202502-0188-01-01
Receipt Date	:	2025-03-05
Test Date	:	2025-03-05 to 2025-03-11
Issue Date	:	2025-03-11
Standards	:	FCC Part 2.1091
Test Method	:	KDB 447498 D01 General RF Exposure Guidance v06
Conclusions	:	**PASS**
		In the configuration tested, the EUT complied with the standards specified above.

Test By	:	Gold.zhang	Gold Zhang
Reviewed By	:	Henry huang	Henry huang
Approved By	:	IVAN SU	Ivan Su

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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Revision History

Report No.	Version	Description	Issued Date
TBR-C-202502-0188-3	Rev.01	Initial issue of report	2025-03-11

1. General Information about EUT

1.1 Client Information

Applicant	:	JEM ACCESSORIES, INC
Address	:	32 Brunswick Avenue Edison New Jersey United States 08817
Manufacturer	:	JEM ACCESSORIES, INC
Address	:	32 Brunswick Avenue Edison New Jersey United States 08817

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Bluetooth FM Transmitter	
Models No.	:	BT82D, BT82DF, AHF9-1010-BLK, MCC9-1032-BLK	
Model Different	:	All of these models are identical on the same PCB, layout and circuit, the only difference is the model name and appearance size color.	
Product Description	:	Operation Frequency:	Bluetooth(BR+EDR): 2402MHz~2480MHz FM: 88.1-107.9 MHz
		Modulation Type:	GFSK(1Mbps) π/4-DQPSK(2Mbps) 8DPSK(3Mbps) FM
		Antenna Gain:	BT: 0.58dBi PCB Antenna FM: 0dBi Spring Antenna
Power Rating	:	Input: DC 12V/24V USB A1 Output: DC 5V/2.4A USB A2 Output: DC 5V/1A	
Software Version	:	Master:AC6956C4;CPU:QFN32	
Hardware Version	:	BT82D_6956_8027_V1.0	
Remark: The above antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.			

2. Measurement Uncertainty

The reported uncertainty of measurement y±U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (ULab)
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.50 dB ±3.10 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.50 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB
Temperature	/	±0.6℃
Humidity	/	±4%
Supply voltages	/	±2%
Time	/	±4%

3. Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025：2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.

4 MPE CALCULATIONS

4.1 EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.2 Exposure Evaluation:

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 the 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

4.3 Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. 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 modeled or measured field strengths or power density, is ≤ 1.0.

This means that:

∑ of MPE ratios ≤ 1.0

4.4 Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

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

5 TEST RESULT:

Bluetooth worst reported.

Mode	N_{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/cm^2) [S]
GFSK	1	2.402	4.716	5±1	6	0.58	20	0.00091
		2.441	5.09	5±1	6	0.58	20	0.00091
		2.480	4.979	5±1	6	0.58	20	0.00091
Pi/4-DQPSK	1	2.402	5.302	5±1	6	0.58	20	0.00091
		2.441	5.65	5±1	6	0.58	20	0.00091
		2.480	5.574	5±1	6	0.58	20	0.00091
8-DPSK	1	2.402	5.593	5±1	6	0.58	20	0.00091
		2.441	5.896	5±1	6	0.58	20	0.00091
		2.480	5.795	5±1	6	0.58	20	0.00091

Note:
N_{TX}= Number of Transmit Antennas
RF Output power specifies that Maximum Conducted Peak Output Power.

FM worst reported.

$$E = EIRP - 20\log D + 104.8$$

where:

E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.

88.1MHz: EIRP=E-104.8+20logD=35.1-104.8+20log3 = -60.16dBm
98.1MHz: EIRP=E-104.8+20logD=44.17-104.8+20log3 = -51.08dBm
107.9MHz: EIRP=E-104.8+20logD=28.73-104.8+20log3 = -56.99dBm

FM Worst Maximum MPE Result									
Mode	N_{TX}	Freq. (MHz)	Max Conducted Power (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (m) [R]	Power Density (W/m^2) [S]	MPE Limits (mW/cm2)
FM	1	88.1	-60.16	-60±1	-59	0	0.2	0.0000000003	0.2
		98.1	-51.08	-51±1	-50	0	0.2	0.0000000020	0.2
		107.9	-56.99	-56±1	-55	0	0.2	0.0000000006	0.2
Note: N_{TX}= Number of Transmit Antennas RF Output power specifies that Maximum Conducted Peak Output Power.									

The EUT equiped with one BTantenna and one FM antenna. so need consider simultaneous transmission;
According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission
operations;
Σ Σof MPE ratios ≤ 1.0
Σ MPE ratios:0.00091+(0.0000000020/0.2)=0.00091001<1.0 PASS
Note
For a more detailed features description, please refer to the RF Test Report.

6 CONCLUSION:

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----END OF REPORT-----