

RF EXPOSURE EVALUATION REPORT

Product Name: Music Box
Trade Mark: Telefonica Tech
Model No.: HM.IP.888.N
Report Number: 2308016302RFC-4
Test Standards: FCC 47 CFR Part 1 Subpart I
FCC ID: 2BG3D-HMIP888N
Test Result: PASS
Date of Issue: September 25, 2024

Prepared for:

Telefonica IOT & Big Data Tech, S.A.U.
Ronda Comunicación S/N Madrid 28050

Prepared by:

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UTTR-RF-FCCPART1-V1.1

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Telefonica IOT & Big Data Tech, S.A.U.
Address of Applicant:	Ronda Comunicación S/N Madrid 28050
Manufacturer:	Zhongshan Hybroad Vision Trading Co., Ltd.
Address of Manufacturer:	Room 102, Yuxing Industrial Park, Huoju Development Zone, Zhongshan, Guangdong China

1.2 EUT INFORMATION

Product Name:	Music Box		
Model No.:	HM.IP.888.N		
Trade Mark:	Telefonica Tech		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac
Sample Received Date:	August 8, 2023		
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.			

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

For 2.4 GHz ISM Band of Wi-Fi	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2412 MHz to 2462 MHz
Support Standards:	IEEE 802.11b/g/n-HT20/n-HT40
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS 7 IEEE 802.11n-HT40: Up to MCS 7
Number of Channels:	IEEE 802.11b:11 IEEE 802.11g:11 IEEE 802.11n-HT20:11 IEEE 802.11n-HT40:7
Channel Separation:	5 MHz
Antenna Type: (Provided by the customer)	PIFA Antenna
Antenna Gain: (Provided by the customer)	3.95 dBi

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For 5 GHz U-NII Bands of Wi-Fi		
Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)	
	5250 MHz to 5350 MHz (U-NII-2A)	
	5470 MHz to 5725 MHz (U-NII-2C)	
	5725 MHz to 5850 MHz (U-NII-3)	
Frequency Ranges:	5180 MHz to 5240 MHz	
	5260 MHz to 5320 MHz	
	5500 MHz to 5700 MHz	
	5745 MHz to 5825 MHz	
Support Standards:	IEEE 802.11a/n/ac	
TPC Function:	Support	
DFS Operational mode:	Slave without radar Interference detection function	
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)	
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)	
	IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)	
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz	
	IEEE 802.11n-HT40/ac-VHT40: 40 MHz	
	IEEE 802.11ac-VHT80: 80 MHz	
Data Rate:	IEEE 802.11a: Up to 54 Mbps	
	IEEE 802.11n-HT20: Up to MCS7	
	IEEE 802.11n-HT40: Up to MCS7	
	IEEE 802.11ac-VHT20: Up to MCS8	
	IEEE 802.11ac-VHT40: Up to MCS9	
	IEEE 802.11ac-VHT80: Up to MCS9	
Number of Channels:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11acVHT80	
	5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11acVHT80	
	5470 MHz to 5725 MHz: 11 for IEEE 802.11a/n-HT20/ac-VHT20 5 for IEEE 802.11n-HT40/ac-VHT40 2 for IEEE 802.11ac-VHT80	
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80	
Antenna Type: (Provided by the customer)	PIFA Antenna	
Antenna Gain (dBi): (Provided by the customer)	5150 - 5250 MHz	3.95 dBi
	5250 - 5350 MHz	3.95 dBi
	5470 - 5725 MHz	3.95 dBi
	5725 - 5850 MHz	3.95 dBi

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1.4 OTHER INFORMATION

Test channels for 2.4 GHz ISM Band of Wi-Fi				
Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11b	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11g	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT20	2412 MHz to 2462 MHz	Channel 1	Channel 6	Channel 11
		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT40	2422 MHz to 2452 MHz	Channel 3	Channel 6	Channel 9
		2422 MHz	2437 MHz	2452 MHz

Test channels for 5 GHz U-NII Bands of Wi-Fi				
Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11a IEEE 802.11n-HT20 IEEE 802.11ac-VHT20	5150 MHz to 5250 MHz	Channel 36	Channel 44	Channel 48
		5180 MHz	5220 MHz	5240 MHz
	5250 MHz to 5350 MHz	Channel 52	Channel 60	Channel 64
		5260 MHz	5300 MHz	5320 MHz
	5470 MHz to 5725 MHz	Channel 100	Channel 116	Channel 140
		5500 MHz	5580 MHz	5700 MHz
IEEE 802.11n-HT40 IEEE 802.11ac-VHT40	5150 MHz to 5250 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
	5250 MHz to 5350 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5470 MHz to 5725 MHz	Channel 54	--	Channel 62
		5270 MHz	--	5310 MHz
IEEE 802.11ac-VHT80	5150 MHz to 5250 MHz	Channel 102	Channel 110	Channel 134
		5510 MHz	5550 MHz	5670 MHz
	5250 MHz to 5350 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz
	5470 MHz to 5725 MHz	--	Channel 42	--
		--	5210 MHz	--
IEEE 802.11ac-VHT80	5250 MHz to 5350 MHz	--	Channel 58	--
		--	5290 MHz	--
	5470 MHz to 5725 MHz	Channel 106	--	--
		5530 MHz	--	--
	5725 MHz to 5850 MHz	--	Channel 155	--
		--	5775 MHz	--

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 1 Subpart I

All test items have been performed and recorded as per the above standards

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

2. EQUIPMENT LIST

Please refer to the RF test report.

3. MPE EVALUATION

3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES
3	KDB 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

3.2 MPE COMPLIANCE REQUIREMENT

3.2.1 Limits

3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Limits for Occupational / Controlled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

Limits for General Population / Uncontrolled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	1	30

Note: f = frequency in MHz: * = Plane-wave equivalents power density.

3.2.2 Test Procedure

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

3.3 MPE CALCULATION METHOD

FCC 47 CFR Part 1 Subpart I

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

S = power density (in appropriate units, e.g., mw/cm²)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = 20cm distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

3.4 MPE CALCULATION RESULTS

Note: For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3.4.1 For WLAN

For Wi-Fi function, operating at 2412MHz to 2462 MHz for IEEE802.11b/g/n and
operating at 5150 MHz to 5250 MHz for IEEE802.11a/n/ac and
operating at 5250 MHz to 5350 MHz for IEEE802.11a/n/ac and
operating at 5470 MHz to 5725 MHz for IEEE802.11a/n/ac and
operating at 5725 MHz to 5850 MHz for IEEE802.11a/n/ac.

3.4.1.1 Antenna Type:

PIFA Antenna

Antenna Gain:

Chain 0: 2412MHz to 2462 MHz: 3.95dBi

Chain 0: 5150 MHz to 5250 MHz: 3.95dBi
5250 MHz to 5350 MHz: 3.95dBi
5470 MHz to 5725 MHz: 3.95dBi
5725 MHz to 5850 MHz: 3.95dBi

3.4.1.2 Results for FCC 47 CFR Part 1 Subpart I

Operating Mode		Freq.	Declared maximum conducted output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
		(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mw/cm ²)	
SISO	IEEE 802.11b	2412	11	1.5	3.95	16.45	44.1570	1	0.0088
		2437	11	1.5	3.95	16.45	44.1570	1	0.0088
		2462	11	1.5	3.95	16.45	44.1570	1	0.0088
	IEEE 802.11g	2412	21	1.5	3.95	26.45	441.5704	1	0.0878
		2437	21	1.5	3.95	26.45	441.5704	1	0.0878
		2462	21	1.5	3.95	26.45	441.5704	1	0.0878
	IEEE 802.11n-HT20	2412	18	1.5	3.95	23.45	221.3095	1	0.0440
		2437	18	1.5	3.95	23.45	221.3095	1	0.0440
		2462	18	1.5	3.95	23.45	221.3095	1	0.0440
	IEEE 802.11n-HT40	2422	19	1.5	3.95	24.45	278.6121	1	0.0554
		2437	19	1.5	3.95	24.45	278.6121	1	0.0554
		2452	19	1.5	3.95	24.45	278.6121	1	0.0554
	IEEE 802.11a	5180	15	1.5	3.95	20.45	110.9175	1	0.0221
		5220	16	1.5	3.95	21.45	139.6368	1	0.0278
		5240	16	1.5	3.95	21.45	139.6368	1	0.0278
		5260	16	1.5	3.95	21.45	139.6368	1	0.0278
		5300	17	1.5	3.95	22.45	175.7924	1	0.0350
		5320	17	1.5	3.95	22.45	175.7924	1	0.0350
		5500	15	1.5	3.95	20.45	110.9175	1	0.0221
		5580	15	1.5	3.95	20.45	110.9175	1	0.0221
		5700	16	1.5	3.95	21.45	139.6368	1	0.0278
		5745	16	1.5	3.95	21.45	139.6368	1	0.0278
		5785	15	1.5	3.95	20.45	110.9175	1	0.0221
		5825	15	1.5	3.95	20.45	110.9175	1	0.0221
	IEEE 802.11n-HT20	5180	13	1.5	3.95	18.45	69.9842	1	0.0139
		5220	14	1.5	3.95	19.45	88.1049	1	0.0175
		5240	15	1.5	3.95	20.45	110.9175	1	0.0221
		5260	15	1.5	3.95	20.45	110.9175	1	0.0221
		5300	15	1.5	3.95	20.45	110.9175	1	0.0221
		5320	15	1.5	3.95	20.45	110.9175	1	0.0221
		5500	14	1.5	3.95	19.45	88.1049	1	0.0175
		5580	14	1.5	3.95	19.45	88.1049	1	0.0175
		5700	15	1.5	3.95	20.45	110.9175	1	0.0221
		5745	14	1.5	3.95	19.45	88.1049	1	0.0175
		5785	14	1.5	3.95	19.45	88.1049	1	0.0175
		5825	13	1.5	3.95	18.45	69.9842	1	0.0139

IEEE 802.11ac-VHT20	5180	13	1.5	3.95	18.45	69.9842	1	0.0139
	5220	14	1.5	3.95	19.45	88.1049	1	0.0175
	5240	14	1.5	3.95	19.45	88.1049	1	0.0175
	5260	15	1.5	3.95	20.45	110.9175	1	0.0221
	5300	15	1.5	3.95	20.45	110.9175	1	0.0221
	5320	15	1.5	3.95	20.45	110.9175	1	0.0221
	5500	14	1.5	3.95	19.45	88.1049	1	0.0175
	5580	14	1.5	3.95	19.45	88.1049	1	0.0175
	5700	15	1.5	3.95	20.45	110.9175	1	0.0221
	5745	15	1.5	3.95	20.45	110.9175	1	0.0221
	5785	14	1.5	3.95	19.45	88.1049	1	0.0175
	5825	14	1.5	3.95	19.45	88.1049	1	0.0175
IEEE 802.11n-HT40	5190	13	1.5	3.95	18.45	69.9842	1	0.0139
	5230	14	1.5	3.95	19.45	88.1049	1	0.0175
	5270	15	1.5	3.95	20.45	110.9175	1	0.0221
	5310	15	1.5	3.95	19.45	88.1049	1	0.0175
	5510	14	1.5	3.95	20.45	110.9175	1	0.0221
	5590	15	1.5	3.95	20.45	110.9175	1	0.0221
	5670	15	1.5	3.95	20.45	110.9175	1	0.0221
	5755	14	1.5	3.95	19.45	88.1049	1	0.0175
	5795	13	1.5	3.95	18.45	69.9842	1	0.0139
IEEE 802.11ac-VHT40	5190	13	1.5	3.95	18.45	69.9842	1	0.0139
	5230	14	1.5	3.95	19.45	88.1049	1	0.0175
	5270	14	1.5	3.95	19.45	88.1049	1	0.0175
	5310	15	1.5	3.95	20.45	110.9175	1	0.0221
	5510	13	1.5	3.95	18.45	69.9842	1	0.0139
	5590	15	1.5	3.95	20.45	110.9175	1	0.0221
	5670	15	1.5	3.95	20.45	110.9175	1	0.0221
	5755	14	1.5	3.95	19.45	88.1049	1	0.0175
	5795	14	1.5	3.95	19.45	88.1049	1	0.0175
IEEE 802.11ac-VHT80	5210	11	1.5	3.95	16.45	44.1570	1	0.0088
	5290	12	1.5	3.95	17.45	55.5904	1	0.0111
	5530	11	1.5	3.95	16.45	44.1570	1	0.0088
	5610	12	1.5	3.95	17.45	55.5904	1	0.0111
	5775	11	1.5	3.95	16.45	44.1570	1	0.0088

3.4.2 Simultaneous Multi-band Transmission MPE Analysis

3.4.2.1 List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Support/Not Support
1	2.4G _WLAN + 5G _WLAN	Support

3.4.2.2 Results for transmit simultaneously

FCC 47 CFR Part 1 Subpart I

No.	Configurations	Maximum MPE Value			Limits
		2.4G WLAN	5G WLAN	Transmit simultaneously	
1	2.4G _WLAN + 5G _WLAN	0.0878	0.0350	0.1228	1

Note:

According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:

$$\text{Transmit simultaneously MPE} = \Sigma \text{ of MPE ratios}$$

$$\text{MPE ratios} = \text{Field strengths or power density} / \text{MPE limit at the test frequency}$$

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
