



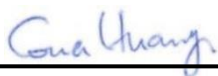
RF EXPOSURE EVALUATION REPORT

FCC ID : A4R-H2E
Equipment : Interactive internet streaming device
Model Name : H2E
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Manufacturer : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part 2.1091 and it complies with applicable limit.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA960638	Rev. 01	Initial issue of report	Sep. 05, 2019
FA960638	Rev. 02	Update section2 and section4	Sep. 11, 2019

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Interactive internet streaming device
Model Name	H2E
FCC ID	A4R-H2E
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz 802.15.4: 2405 MHz ~ 2475 MHz
Mode	WLAN: 802.11a/b/g/n/ac HT20 / HT40 / VHT20 / VHT40 / VHT80 Bluetooth BR/EDR/LE 802.15.4: O-QPSK
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Reviewed by: Jason Wang

Report Producer: Daisy Peng

2. Maximum RF average output power

Mode / Band	Tune-up Limit (dBm)		
	LE	BDR	EDR
2.4GHz Bluetooth	11.0	10.0	9.0
802.15.4	20.0		

WLAN (CDD / TxBF) 2.4GHz

Mode / Band	Tune-up Limit (dBm)	
	CDD (dBm) (1+2)	TxBF (dBm) (1+2)
11b	27.0	Not Supported
11g	26.5	Not Supported
HT20	26.5	Not Supported
HT40	17.0	Not Supported
VHT20	26.5	Not Supported
VHT40	17.0	Not Supported

WLAN (CCD/TxBF) 5GHz Mesh Mode

Mode / Band	Tune-up Limit (dBm)							
	CDD (1+2)				TxBF (1+2)			
	5.2 GHz	5.3 GHz	5.6 GHz	5.8 GHz	5.2 GHz	5.3 GHz	5.6 GHz	5.8 GHz
11a	25.0	-	-	26.0	-	-	-	-
HT20	25.0	-	-	26.0	-	-	-	-
HT40	26.5	-	-	27.0	-	-	-	-
VHT20	25.0	-	-	26.0	24.5	-	-	26.0
VHT40	26.0	-	-	26.5	25.0	-	-	26.5
VHT80	19.0	-	-	23.0	19.5	-	-	23.5

WLAN (CCD/TxBF) 5GHz Client Mode

Mode / Band	Tune-up Limit (dBm)							
	CDD (1+2)				TxBF (1+2)			
	5.2 GHz	5.3 GHz	5.6 GHz	5.8 GHz	5.2 GHz	5.3 GHz	5.6 GHz	5.8 GHz
11a	18.5	20.0	20.0	26.0	-	-	-	-
HT20	18.5	19.5	19.5	26.0	-	-	-	-
HT40	22.0	22.0	23.0	27.0	-	-	-	-
VHT20	18.5	19.0	19.5	26.0	18.5	19.0	20.0	26.0
VHT40	22.0	22.0	23.0	26.5	19.0	19.5	22.0	26.5
VHT80	19.0	20.0	24.0	23.0	19.5	21.5	22.0	23.5

3. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

4. Radio Frequency Radiation Exposure Evaluation

4.1. Power Density Calculation

<Non-beamforming mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
802.15.4	2405.0	5.18	20.00	25.180	0.330	329.610	0.066	1.000	0.066
Bluetooth	2402.0	1.50	11.00	12.500	0.018	17.783	0.004	1.000	0.004
2.4GHz WLAN	2412.0	2.39	27.00	29.390	0.869	868.960	0.173	1.000	0.173
5.2GHz WLAN	5180.0	7.48	26.50	33.980	2.500	2500.345	0.498	1.000	0.498
5.3GHz WLAN	5250.0	7.30	22.00	29.300	0.851	851.138	0.169	1.000	0.169
5.5GHz WLAN	5500.0	6.33	24.00	30.330	1.079	1078.947	0.215	1.000	0.215
5.8GHz WLAN	5745.0	5.48	27.00	32.480	1.770	1770.109	0.352	1.000	0.352

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band

<Beamforming mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
5.2GHz WLAN	5180.0	8.78	24.50	33.280	2.128	2128.139	0.424	1.000	0.424
5.3GHz WLAN	5250.0	8.56	21.50	30.060	1.014	1013.911	0.202	1.000	0.202
5.5GHz WLAN	5500.0	8.37	22.00	30.370	1.089	1088.930	0.217	1.000	0.217
5.8GHz WLAN	5745.0	8.15	26.50	34.650	2.917	2917.427	0.581	1.000	0.581

Note:

- For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
- This device supports Beamforming for WLAN 5GHz VHT20/VHT40/VHT80 only; therefore, in the table above which consider directional Gain 8.78 / 8.56 / 8.37 / 8.15dBi for WLAN 5.2 / 5.3 / 5.5 / 5.8GHz Beamforming mode.

**4.2. Collocated Power Density Calculation**

Simultaneous Transmission Configuration	WLAN 5G + 802.15.4	Support
	WLAN5G + WLAN 2.4G	Support
	WLAN5G+ BT	Support

Note:

1. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for each Sim-Tx configuration.
2. Considering the all the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant

2.4GHz WLAN Max Power Density / Limit	5GHz WLAN Max Power Density / Limit	Σ (Power Density / Limit)
0.173	0.581	0.754

BT Max Power Density / Limit	5GHz WLAN Max Power Density / Limit	Σ (Power Density / Limit)
0.004	0.581	0.585

802.15.4 Max Power Density / Limit	5GHz WLAN Max Power Density / Limit	Σ (Power Density / Limit)
0.066	0.581	0.647

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.