

Maximum Permissible Exposure Report

Product Information

EUT	:4K HDMI dongle
Model Number	:IPA1104HDW- 01-400-05T-TiVo,SN8BABX(X=A TO Z)
Model Declaration	:Different shape of the cover, different color of the cover.
Test Model	:IPA1104HDW- 01-400-05T-TiVo
Power Supply	:DC 5V by adapter
Hardware version	:SMB.195.07
Software version	:android9.0
Bluetooth Version	:V5.0+EDR
Channel Number	:79 Channels for Bluetooth EDR(DSS) :40 Channels for Bluetooth BLE(DTS)
Modulation Technology	:GFSK, $\pi/4$ -DQPSK, 8-DPSK for Bluetooth EDR(DSS) :GFSK for Bluetooth BLE(DTS)
Data Rates	:Bluetooth EDR(DSS): 1~3Mbps;Bluetooth BLE(DTS): 1Mbps
WLAN	:Supported IEEE 802.11a/b/g/n/ac
WLAN FCC Operation Frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz / 5180-5240MHz / 5745-5825MHz :IEEE 802.11n HT40: 5190-5230MHz / 5755-5795MHz IEEE 802.11a: 5180-5240MHz / 5745-5825MHz IEEE 802.11ac VHT20: 5180-5240MHz / 5745-5825MHz IEEE 802.11ac VHT40: 5190-5230MHz / 5755-5795MHz IEEE 802.11ac VHT80: 5210MHz / 5775MHz
WLAN Channel Number	11 Channels for 2412-2462MHz(IEEE 802.11b/g/n HT20) 4 Channels for 5180-5240MHz (IEEE 802.11a/ac VHT20/n HT20) 2 Channels for 5190-5230MHz (IEEE 802.11ac VHT40/n HT40) :1 Channels for 5210MHz (IEEE 802.11ac VHT80) 5 Channels for 5745-5825MHz(IEEE 802.11a/ac VHT20/n HT20) 2 Channels for 5755-5795MHz(IEEE 802.11ac VHT40/n HT40) 1 Channels for 5775MHz(IEEE 802.11ac VHT80)
WLAN Modulation Technology	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) :IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Type And Gain	Two Antennas: Internal Antenna 1: 2.5 dBi(Max.), for TX/RX (WLAN 2.4G Band/Bluetooth), 2.56 dBi(Max.), for TX/RX (WLAN 5.2G Band) :3.02 dBi(Max.), for TX/RX (WLAN 5.8G Band) Internal Antenna 2: 3.99 dBi(Max.), for TX/RX (WLAN 2.4G Band), 2.73 dBi(Max.), for TX/RX (WLAN 5.2G Band) 2.82 dBi(Max.), for TX/RX (WLAN 5.8G Band)
Directional Gain	6.32 dBi for MIMO(2.4G Band) :5.66 dBi for MIMO(5.2G Band) 5.93 dBi for MIMO(5.8G Band)

Note: Antenna position refer to EUT Photos.

2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for 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 modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3.1 Refer evaluation method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices

3.2 Limit

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

4. MPE Calculation Method

Predication of MPE limit at a given distance

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 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

5. Antenna Information

This Product can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Description	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 1	WiFi Antenna	Internal Antenna	2400 MHz – 2500 MHz	2.50 dBi
			5150 MHz – 5250 MHz	2.56 dBi
			5720 MHz – 5900 MHz	3.02 dBi
	BT Antenna	Internal Antenna	2400 MHz – 2500 MHz	2.50 dBi
Antenna 2	WiFi Antenna	Internal Antenna	2400 MHz – 2500 MHz	3.99 dBi
			5150 MHz – 5250 MHz	2.73 dBi
			5720 MHz – 5900 MHz	2.82 dBi

6. Conducted Power

2.4G Band:

Bluetooth(BDR+EDR)

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)
GFSK	00	2402	5.989
	39	2441	6.480
	78	2480	6.608
$\pi/4$ -DQPSK	00	2402	7.557
	39	2441	7.841
	78	2480	7.869
8-DPSK	00	2402	7.518
	39	2441	7.876
	78	2480	7.845

Bluetooth(BLE)

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)
GFSK	00	2402	9.943
	39	2441	10.343
	78	2480	10.473

WiFi 2.4GHz Band

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)		
			Antenna 1	Antenna 2	Sum
IEEE 802.11b	1	2412	11.251	11.889	-/-
	6	2437	12.055	11.828	-/-
	11	2462	10.984	11.231	-/-
IEEE 802.11g	1	2412	16.855	17.549	-/-
	6	2437	17.411	17.476	-/-
	11	2462	17.151	17.369	-/-
IEEE 802.11n HT20	1	2412	17.141	17.373	20.27
	6	2437	17.383	17.489	20.45
	11	2462	17.210	17.09	20.16

5G Band
UNII-1 Band

Test Mode	Channel	Frequency (MHz)	Measured Conducted Average Power (dBm)		
			Antenna 1	Antenna 2	Sum
IEEE 802.11a	36	5180	9.416	9.857	/
	40	5200	9.516	9.882	/
	48	5240	10.141	10.712	/
IEEE 802.11n HT20	36	5180	9.217	9.727	12.49
	40	5200	9.18	9.89	12.56
	48	5240	10.024	10.527	13.29
IEEE 802.11ac VHT20	36	5180	9.231	9.679	12.47
	40	5200	9.415	9.857	12.65
	48	5240	10.006	10.622	13.34
IEEE 802.11n HT40	38	5190	9.279	9.578	12.44
	46	5230	9.955	10.224	13.10
IEEE 802.11ac VHT40	38	5190	9.163	9.625	12.41
	46	5230	9.978	10.265	13.13
IEEE 802.11ac VHT80	42	5210	8.653	5.247	10.29

UNII-3 Band

Test Mode	Channel	Frequency (MHz)	Measured Conducted Average Power (dBm)		
			Antenna 1	Antenna 2	Sum
IEEE 802.11a	149	5745	10.510	10.266	/
	157	5785	11.625	10.610	/
	165	5825	12.285	11.263	/
IEEE 802.11n HT20	149	5745	10.634	10.174	13.42
	157	5785	11.605	10.588	14.14
	165	5825	12.010	11.172	14.62
IEEE 802.11ac VHT20	149	5745	10.782	10.087	13.46
	157	5785	11.391	10.492	13.98
	165	5825	12.113	11.246	14.71
IEEE 802.11n HT40	151	5755	11.213	10.332	13.81
	159	5795	11.880	11.178	14.55
IEEE 802.11ac VHT40	151	5755	11.112	10.475	13.82
	159	5795	11.86	11.077	14.50
IEEE 802.11ac VHT80	155	5775	6.397	5.472	8.97

7. Manufacturing Tolerance

Bluetooth(BDR+EDR)

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	6.0	6.5	6.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
$\pi/4$ -DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	7.5	7.5	7.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
8-DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	7.5	7.5	7.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Bluetooth(BLE)

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	10.0	10.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

WiFi 2.4GHz Band – Antenna 1

IEEE 802.11b (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.0	12.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	17.0	17.0	17.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	17.0	17.0	17.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

WiFi 2.4GHz Band – Antenna 2

IEEE 802.11b (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.5	11.5	11.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	17.0	17.0	17.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	17.0	17.0	17.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

UNII-1 Band – Antenna 1

IEEE 802.11a (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.0	9.5	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.0	9.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.0	9.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	9.0	10.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	9.0	10.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 42	--	--
Target (dBm)	8.5	--	--
Tolerance $\pm$ (dB)	1.0	--	--

UNII-1 Band – Antenna 2

IEEE 802.11a (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.5	9.5	10.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.5	9.5	10.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	9.5	9.5	10.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	9.5	10.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	9.5	10.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 42	--	--
Target (dBm)	5.0	--	--
Tolerance $\pm$ (dB)	1.0	--	--

UNII-3 Band – Antenna 1

IEEE 802.11a (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.5	11.5	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.5	11.5	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.5	11.0	12.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 151	Channel 159	--
Target (dBm)	11.0	11.5	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 151	Channel 159	--
Target (dBm)	11.0	11.5	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 155	--	--
Target (dBm)	6.0	--	--
Tolerance $\pm$ (dB)	1.0	--	--

UNII-3 Band – Antenna 2

IEEE 802.11a (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.0	10.5	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.0	10.5	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	10.0	10.5	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 151	Channel 159	--
Target (dBm)	10.0	11.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 151	Channel 159	--
Target (dBm)	10.0	11.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 155	--	--
Target (dBm)	5.0	--	--
Tolerance $\pm$ (dB)	1.0	--	--

8. Measurement Results

8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Bluetooth(BDR+EDR)

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
GFSK	7.50	5.6234	2.50	1.7783	100%	0.0020	1.0000
$\pi/4$ -DQPSK	8.50	7.0795	2.50	1.7783	100%	0.0025	1.0000
8-DPSK	8.50	7.0795	2.50	1.7783	100%	0.0025	1.0000

Bluetooth(BLE)

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
GFSK	11.00	12.5893	2.50	1.7783	100%	0.0045	1.0000

WiFi 2.4GHz Band – Ant 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11b	13.00	19.9526	2.50	1.7783	100%	0.0071	1.0000
IEEE 802.11g	18.00	63.0957	2.50	1.7783	100%	0.0223	1.0000
IEEE 802.11n HT20	18.00	63.0957	2.50	1.7783	100%	0.0223	1.0000

WiFi 2.4GHz Band – Ant 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11b	12.50	17.7828	3.99	2.5061	100%	0.0089	1.0000
IEEE 802.11g	18.00	63.0957	3.99	2.5061	100%	0.0315	1.0000
IEEE 802.11n HT20	18.00	63.0957	3.99	2.5061	100%	0.0315	1.0000

UNII-1 Band – Ant 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	11.00	12.5893	2.56	1.8030	100%	0.0045	1.0000
IEEE 802.11n HT20	11.00	12.5893	2.56	1.8030	100%	0.0045	1.0000
IEEE 802.11ac VHT20	11.00	12.5893	2.56	1.8030	100%	0.0045	1.0000
IEEE 802.11n HT40	11.00	12.5893	2.56	1.8030	100%	0.0045	1.0000
IEEE 802.11ac VHT40	11.00	12.5893	2.56	1.8030	100%	0.0045	1.0000
IEEE 802.11ac VHT80	9.50	8.9125	2.56	1.8030	100%	0.0032	1.0000

UNII-1 Band – Ant 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	11.50	14.1254	2.73	1.8750	100%	0.0053	1.0000
IEEE 802.11n HT20	11.50	14.1254	2.73	1.8750	100%	0.0053	1.0000
IEEE 802.11ac VHT20	11.50	14.1254	2.73	1.8750	100%	0.0053	1.0000
IEEE 802.11n HT40	11.00	12.5893	2.73	1.8750	100%	0.0047	1.0000
IEEE 802.11ac VHT40	11.00	12.5893	2.73	1.8750	100%	0.0047	1.0000
IEEE 802.11ac VHT80	6.00	3.9811	2.73	1.8750	100%	0.0015	1.0000

UNII-3 Band – Ant 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	13.00	19.9526	3.02	2.0045	100%	0.0080	1.0000
IEEE 802.11n HT20	13.00	19.9526	3.02	2.0045	100%	0.0080	1.0000
IEEE 802.11ac VHT20	13.00	19.9526	3.02	2.0045	100%	0.0080	1.0000
IEEE 802.11n HT40	12.50	17.7828	3.02	2.0045	100%	0.0071	1.0000
IEEE 802.11ac VHT40	12.50	17.7828	3.02	2.0045	100%	0.0071	1.0000
IEEE 802.11ac VHT80	7.00	5.0119	3.02	2.0045	100%	0.0020	1.0000

UNII-3 Band – Ant 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	12.00	15.8489	2.82	1.9143	100%	0.0060	1.0000
IEEE 802.11n HT20	12.00	15.8489	2.82	1.9143	100%	0.0060	1.0000
IEEE 802.11ac VHT20	12.00	15.8489	2.82	1.9143	100%	0.0060	1.0000
IEEE 802.11n HT40	12.00	15.8489	2.82	1.9143	100%	0.0060	1.0000
IEEE 802.11ac VHT40	12.00	15.8489	2.82	1.9143	100%	0.0060	1.0000
IEEE 802.11ac VHT80	6.00	3.9811	2.82	1.9143	100%	0.0015	1.0000

Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

8.2 Simultaneous Transmission MPE

Maximum Simultaneous transmission MPE Ratios for Antenna 1 and Antenna 2

Maximum MPE(mW/cm ²) Ant.1	Maximum MPE(mW/cm ²) Ant.2	ΣMPE (mW/cm ²)	Limit (mW/cm ²)	Results
0.0223	0.0315	0.0538	1.0	PASS

9. Conclusion

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

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