

Maximum Permissible Exposure Report

Product Information

EUT	: 4K Set top box
Model No./HVIN	: IPA1114HDW-02,SN6BBAX("X" on behalf of one of 26 English Letters A-Z)
Model Declaration	: All the same except for model name and color of shape.
Test Model	: IPA1114HDW-02
Power Supply	: DC 5.0V by Adapter
Hardware version	: SMB.207.09
Software version	: SEI530-userdebug 10 QTT2.200720.001 750 release-keys

Bluetooth

Bluetooth Version	: V5.0
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): 1/2/3Mbps; : Bluetooth BLE(DTS): 1/2Mbps
Antenna Type And Gain	: Internal Antenna 3: 1.43 dBi(Max.)

WiFi

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	Three Antennas: Internal Antenna 1: 2.88 dBi(Max.), for TX/RX (WLAN 2.4G Band), 2.56 dBi(Max.), for TX/RX (WLAN 5.2G Band) 3.27 dBi(Max.), for TX/RX (WLAN 5.8G Band) : Internal Antenna 2: 2.83 dBi(Max.), for TX/RX (WLAN 2.4G Band), 6.39 dBi(Max.), for TX/RX (WLAN 5.2G Band) 5.93 dBi(Max.), for TX/RX (WLAN 5.8G Band)

Note1: 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;

The Antenna Gain shows in page 1 – 2.

6. Conducted Power

2.4G Band:

Bluetooth(BDR+EDR)

Test Mode	Channel	Frequency (MHz)	Measured Peak Output Power (dBm)
GFSK	00	2402	5.55
	39	2441	6.49
	78	2480	5.91
$\pi/4$ -DQPSK	00	2402	6.55
	39	2441	7.43
	78	2480	6.79
8-DPSK	00	2402	7.17
	39	2441	7.89
	78	2480	7.31

Bluetooth(BLE)

TestMode	Channel	Channel	Result[dBm]
BLE_1M	00	2402	8.39
	19	2440	7.06
	39	2480	6.37
BLE_2M	00	2402	8.38
	19	2440	7.12
	39	2480	6.49

WiFi 2.4GHz Band

TestMode	Antenna	Channel	Result[dBm]
11B	Ant1	2412	16.09
	Ant2	2412	15.40
	Ant1	2437	14.59
	Ant2	2437	14.63
	Ant1	2462	15.80
	Ant2	2462	15.93
11G	Ant1	2412	11.95
	Ant2	2412	11.02
	Ant1	2437	10.50
	Ant2	2437	10.56
	Ant1	2462	11.49
	Ant2	2462	11.36
11N20MIMO	Ant1	2412	11.67
	Ant2	2412	10.87
	Ant1	2437	10.33
	Ant2	2437	10.44
	Ant1	2462	11.40
	Ant2	2462	9.95

5G Band
UNII-1 Band

TestMode	Antenna	Channel	Result[dBm]
11A	Ant1	5180	9.61
	Ant2	5180	5.22
	Ant1	5200	8.61
	Ant2	5200	6.34
	Ant1	5240	8.28
	Ant2	5240	6.95
11N20MIMO	Ant1	5180	6.2
	Ant2	5180	3.83
	Ant1	5200	7.33
	Ant2	5200	3.6
	Ant1	5240	5.27
	Ant2	5240	4.61
11N40MIMO	Ant1	5190	9.69
	Ant2	5190	4.4
	Ant1	5230	8.9
	Ant2	5230	5.75
11AC20MIMO	Ant1	5180	7.03
	Ant2	5180	2.98
	Ant1	5200	4.44
	Ant2	5200	3.76
	Ant1	5240	6.07
	Ant2	5240	3.77
11AC40MIMO	Ant1	5190	8.27
	Ant2	5190	4.72
	Ant1	5230	8.27
	Ant2	5230	5.24
11AC80MIMO	Ant1	5210	9.57
	Ant2	5210	6.03

UNII-3 Band

TestMode	Antenna	Channel	Result[dBm]
11A	Ant1	5745	13.04
	Ant2	5745	12.09
	Ant1	5785	13.55
	Ant2	5785	12.55
	Ant1	5825	13.84
	Ant2	5825	12.50
11N20MIMO	Ant1	5745	13.04
	Ant2	5745	12.23
	Ant1	5785	13.59
	Ant2	5785	12.54
	Ant1	5825	13.94
	Ant2	5825	12.51
11N40MIMO	Ant1	5755	12.51
	Ant2	5755	11.91
	Ant1	5795	13.06
	Ant2	5795	12.39
11AC20MIMO	Ant1	5745	13.27
	Ant2	5745	12.19
	Ant1	5785	13.53
	Ant2	5785	12.55
	Ant1	5825	13.72
	Ant2	5825	12.59
11AC40MIMO	Ant1	5755	12.27
	Ant2	5755	11.90
	Ant1	5795	13.00
	Ant2	5795	12.22
11AC80MIMO	Ant1	5775	12.80
	Ant2	5775	9.25

7. Manufacturing Tolerance

Bluetooth(BDR+EDR)

GFSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	5.0	6.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
$\pi/4$ -DQPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	6.0	6.5	6.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
8-DPSK (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	6.5	7.0	6.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Bluetooth(BLE)

GFSK 1Mbps (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	7.5	6.5	5.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
GFSK 2Mbps (Peak)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	7.5	6.5	6.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

WiFi 2.4GHz Band – Antenna 1

IEEE 802.11b (AV)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	15.5	14.0	15.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (AV)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.0	10.0	11.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (AV)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	11.0	9.5	10.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0

WiFi 2.4GHz Band – Antenna 2

IEEE 802.11b (AV)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.5	14.0	15.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (AV)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	10.5	10.0	10.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (AV)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	10.0	9.5	9.0
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	9.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	6.0	7.0	5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	7.0	4.0	6.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	9.0	9.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	8.0	8.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 42	--	--
Target (dBm)	9.0	--	--
Tolerance $\pm$ (dB)	1.0	--	--

UNII-1 Band – Antenna 2

IEEE 802.11a (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	5.0	6.0	6.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	3.5	3.5	4.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	3.0	3.5	3.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	4.0	5.5	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 38	Channel 46	--
Target (dBm)	4.5	5.0	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 42	--	--
Target (dBm)	6.0	--	--
Tolerance $\pm$ (dB)	1.0	--	--

UNII-3 Band – Antenna 1

IEEE 802.11a (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.5	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.5	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ac VHT20 (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.5	13.0	13.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Maximum)			
Channel	Channel 151	Channel 159	--
Target (dBm)	12.0	12.5	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT40 (Maximum)			
Channel	Channel 151	Channel 159	--
Target (dBm)	11.5	12.5	--
Tolerance $\pm$ (dB)	1.0	1.0	--
IEEE 802.11ac VHT80 (Maximum)			
Channel	Channel 155	--	--
Target (dBm)	12.0	--	--
Tolerance $\pm$ (dB)	1.0	--	--

UNII-3 Band – Antenna 2

IEEE 802.11a (Maximum)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	11.5	12.0	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)	11.5	12.0	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)	11.5	12.0	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)	9.0	--	--
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	7.00	5.0119	1.43	1.3900	100%	0.0014	1.0000
$\pi/4$ -DQPSK	7.50	5.6234	1.43	1.3900	100%	0.0016	1.0000
8-DPSK	8.00	6.3096	1.43	1.3900	100%	0.0017	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 1Mbps	8.50	7.0795	1.43	1.3900	100%	0.0020	1.0000
GFSK 2Mbps	8.50	7.0795	1.43	1.3900	100%	0.0020	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	16.50	44.6684	2.88	1.9409	100%	0.0173	1.0000
IEEE 802.11g	12.00	15.8489	2.88	1.9409	100%	0.0061	1.0000
IEEE 802.11n HT20	12.00	15.8489	2.88	1.9409	100%	0.0061	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	16.00	39.8107	2.83	1.9187	100%	0.0152	1.0000
IEEE 802.11g	11.50	14.1254	2.83	1.9187	100%	0.0054	1.0000
IEEE 802.11n HT20	11.00	12.5893	2.83	1.9187	100%	0.0048	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	10.00	10.0000	2.56	1.8030	100%	0.0036	1.0000
IEEE 802.11n HT20	8.00	6.3096	2.56	1.8030	100%	0.0023	1.0000
IEEE 802.11ac VHT20	8.00	6.3096	2.56	1.8030	100%	0.0023	1.0000
IEEE 802.11n HT40	10.00	10.0000	2.56	1.8030	100%	0.0036	1.0000
IEEE 802.11ac VHT40	9.00	7.9433	2.56	1.8030	100%	0.0029	1.0000
IEEE 802.11ac VHT80	10.00	10.0000	2.56	1.8030	100%	0.0036	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	7.50	5.6234	6.39	4.3551	100%	0.0049	1.0000
IEEE 802.11n HT20	5.00	3.1623	6.39	4.3551	100%	0.0027	1.0000
IEEE 802.11ac VHT20	4.50	2.8184	6.39	4.3551	100%	0.0024	1.0000
IEEE 802.11n HT40	6.50	4.4668	6.39	4.3551	100%	0.0039	1.0000
IEEE 802.11ac VHT40	6.00	3.9811	6.39	4.3551	100%	0.0035	1.0000
IEEE 802.11ac VHT80	7.00	5.0119	6.39	4.3551	100%	0.0043	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	14.00	25.1189	3.27	2.1232	100%	0.0106	1.0000
IEEE 802.11n HT20	14.00	25.1189	3.27	2.1232	100%	0.0106	1.0000
IEEE 802.11ac VHT20	14.00	25.1189	3.27	2.1232	100%	0.0106	1.0000
IEEE 802.11n HT40	13.50	22.3872	3.27	2.1232	100%	0.0095	1.0000
IEEE 802.11ac VHT40	13.50	22.3872	3.27	2.1232	100%	0.0095	1.0000
IEEE 802.11ac VHT80	13.00	19.9526	3.27	2.1232	100%	0.0084	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	13.00	19.9526	5.93	3.9174	100%	0.0156	1.0000
IEEE 802.11n HT20	13.00	19.9526	5.93	3.9174	100%	0.0156	1.0000
IEEE 802.11ac VHT20	13.00	19.9526	5.93	3.9174	100%	0.0156	1.0000
IEEE 802.11n HT40	12.50	17.7828	5.93	3.9174	100%	0.0139	1.0000
IEEE 802.11ac VHT40	12.50	17.7828	5.93	3.9174	100%	0.0139	1.0000
IEEE 802.11ac VHT80	10.0	10.0000	5.93	3.9174	100%	0.0078	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 and Antenna 3

Maximum MPE(mW/cm ²) Ant.1	Maximum MPE(mW/cm ²) Ant.2	Maximum MPE(mW/cm ²) Ant.3	Σ MPE (mW/cm ²)	Limit (mW/cm ²)	Results
0.0173	0.0152	0.0020	0.0327	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-----