

MPE TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310
FCC ID: O6ZGFHD100

Equipment Under Test : IP-set top BOX
Model Name : GFHD100
Serial No. : N/A
Applicant : HUMAX CO., Ltd.
Manufacturer : HUMAX CO., Ltd.
Date of Test(s) : 2012. 05. 22
Date of Issue : 2012. 06. 05

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Alvin Kim

Date

2012. 06. 05

Approved By:



Feel Jeong

Date

2012. 06. 05

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd.(Gunpo Laboratory)

- 705, Dongchun-Dong Sooji-Gu, Yongin-Shi, Kyungki-Do, South Korea.
- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

www.ee.sgs.com/korea

Phone No. : +82 31 428 5700

Fax No. : +82 31 427 2371

1.2 Details of applicant

Applicant : HUMAX CO., Ltd.

Address : HUMAX Village, 11-4, Sunae-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-875, Korea

Contact Person : Im, Byung-Suk

Phone No. : +82 31 776 6341

1.3 Description of EUT

Kind of Product	IP-set top BOX									
Model Name	GFHD100									
Serial Number	N/A									
Power Supply	AC 110 V									
Frequency Range	2 402 MHz ~ 2 480 MHz (BT, BT LE), 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20), 2 422 MHz ~ 2 452 MHz (11n_HT40), 5 745 MHz ~ 5 825 MHz (11a/n_HT20), 5 755 MHz ~ 5 795 MHz (11n_HT40), 5 180 MHz ~ 5 240 MHz (11a/n_HT20 – Non DFS), 5 190 MHz ~ 5 230 MHz (11n_HT40 – Non DFS)									
Modulation Technique	DSSS, OFDM									
Number of Channels	79 channel(BT), 40 channel(BT LE), 11 channel(11b/g/n_HT20), 7 channel(11n_HT40), 5 channel(11a/n_HT20), 2 channel(11n_HT40), 4 channel(11a/n_HT20 – Non DFS), 2 channel(11n_HT40 – Non DFS)									
Antenna Type	Fixed type (2 Tx / 2 Rx)									
Antenna Gain	WLAN	<table border="1"> <tr> <td>ANT0</td> <td>ANT1</td> </tr> <tr> <td>2 412 MHz ~ 2 462 MHz: 3.42 dB i,</td> <td>2 412 MHz ~ 2 462 MHz: 4.40 dB i,</td> </tr> <tr> <td>5 745 MHz ~ 5 825 MHz: 4.94 dB i,</td> <td>5 745 MHz ~ 5 825 MHz: 5.20 dB i,</td> </tr> <tr> <td>5 180 MHz ~ 5 240 MHz: 4.71 dB i</td> <td>5 180 MHz ~ 5 240 MHz: 4.13 dB i</td> </tr> </table>	ANT0	ANT1	2 412 MHz ~ 2 462 MHz: 3.42 dB i,	2 412 MHz ~ 2 462 MHz: 4.40 dB i,	5 745 MHz ~ 5 825 MHz: 4.94 dB i,	5 745 MHz ~ 5 825 MHz: 5.20 dB i,	5 180 MHz ~ 5 240 MHz: 4.71 dB i	5 180 MHz ~ 5 240 MHz: 4.13 dB i
	ANT0	ANT1								
2 412 MHz ~ 2 462 MHz: 3.42 dB i,	2 412 MHz ~ 2 462 MHz: 4.40 dB i,									
5 745 MHz ~ 5 825 MHz: 4.94 dB i,	5 745 MHz ~ 5 825 MHz: 5.20 dB i,									
5 180 MHz ~ 5 240 MHz: 4.71 dB i	5 180 MHz ~ 5 240 MHz: 4.13 dB i									
Bluetooth	2 402 MHz ~ 2 480 MHz: 4.40 dB i (Same to ANT1 of WLAN)									

1.4. Declaration by the manufacturer

- EUT does not use 11b of ANT1 port.

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1.5. Test Report Revision

Revision	Report number	Description
0	F690501/RF-RTL005569	Initial
1	F690501/RF-RTL005569-1	Modify FCC ID

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2. RF Exposure Evaluation

2.1 Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300 – 1 500	--	--	F/1500	30
<u>1 500 – 100 000</u>	--	--	<u>1</u>	<u>30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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2.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

2.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

-Operation mode: WLAN

Operation Mode	Antenna	Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
11b	ANT0	Low	2 412	8.49	100	3.42	0.003 088
		Middle	2 437	8.18	100	3.42	0.002 876
		High	2 462	8.10	100	3.42	0.002 823
	ANT1	Low	2 412	Not Support			
		Middle	2 437				
		High	2 462				
11g	ANT0	Low	2 412	9.01	100	3.42	0.003 481
		Middle	2 437	8.71	100	3.42	0.003 249
		High	2 462	8.69	100	3.42	0.003 234
	ANT1	Low	2 412	8.65	100	4.40	0.004 015
		Middle	2 437	8.42	100	4.40	0.003 808
		High	2 462	8.06	100	4.40	0.003 505
11n_HT20	ANT0	Low	2 412	9.05	100	3.42	0.003 513
		Middle	2 437	8.75	100	3.42	0.003 279
		High	2 462	8.88	100	3.42	0.003 379
	ANT1	Low	2 412	8.75	100	4.40	0.004 109
		Middle	2 437	8.23	100	4.40	0.003 645
		High	2 462	8.21	100	4.40	0.003 629
	ANT0+ANT1 (Calculated)	Low	2 412	11.91	100	6.93	0.015 231
		Middle	2 437	11.51	100	6.93	0.013 891
		High	2 462	11.57	100	6.93	0.014 084

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Operation Mode	Antenna	Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
11n_HT40	ANT0	Low	2 422	8.23	100	3.42	0.002 909
		Middle	2 437	8.14	100	3.42	0.002 849
		High	2 452	8.09	100	3.42	0.002 817
	ANT1	Low	2 422	7.72	100	4.40	0.002 587
		Middle	2 437	7.68	100	4.40	0.002 563
		High	2 452	7.57	100	4.40	0.002 499
	ANT0+ANT1 (Calculated)	Low	2 422	10.99	100	6.93	0.012 323
		Middle	2 437	10.93	100	6.93	0.012 154
		High	2 452	10.85	100	6.93	0.011 932

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Operation Mode	Antenna	Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
11a	ANT0	Low	5 745	9.18	100	4.94	0.005 137
		Middle	5 785	8.65	100	4.94	0.004 547
		High	5 825	8.73	100	4.94	0.004 632
	ANT1	Low	5 745	10.33	100	5.20	0.007 108
		Middle	5 785	10.05	100	5.20	0.006 664
		High	5 825	9.82	100	5.20	0.006 320
11n_HT20	ANT0	Low	5 745	9.06	100	4.94	0.004 997
		Middle	5 785	8.54	100	4.94	0.004 433
		High	5 825	8.82	100	4.94	0.004 729
	ANT1	Low	5 745	9.71	100	5.20	0.006 162
		Middle	5 785	10.00	100	5.20	0.006 588
		High	5 825	10.22	100	5.20	0.006 930
	ANT0+ANT1 (Calculated)	Low	5 745	12.41	100	8.08	0.022 271
		Middle	5 785	12.34	100	8.08	0.021 914
		High	5 825	12.59	100	8.08	0.023 213
11n_HT40	ANT0	Low	5 755	8.40	100	4.94	0.004 293
		High	5 795	8.18	100	4.94	0.004 081
	ANT1	Low	5 755	9.72	100	5.20	0.006 176
		High	5 795	9.36	100	5.20	0.005 685
	ANT0+ANT1 (Calculated)	Low	5 755	12.12	100	8.08	0.020 832
		High	5 795	11.82	100	8.08	0.019 442

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Operation Mode	Antenna	Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
Non DFS 11a	ANT0	Low	5 180	10.13	100	4.71	0.006 064
		Middle	5 220	9.91	100	4.71	0.005 764
		High	5 240	9.82	100	4.71	0.005 646
	ANT1	Low	5 180	11.14	100	4.13	0.006 695
		Middle	5 220	11.10	100	4.13	0.006 633
		High	5 240	11.00	100	4.13	0.006 482
Non DFS 11n_HT20	ANT0	Low	5 180	10.17	100	4.71	0.006 120
		Middle	5 220	9.91	100	4.71	0.005 764
		High	5 240	9.92	100	4.71	0.005 777
	ANT1	Low	5 180	10.86	100	4.13	0.006 277
		Middle	5 220	10.87	100	4.13	0.006 291
		High	5 240	10.68	100	4.13	0.006 022
	ANT0+ANT1 (Calculated)	Low	5 180	13.54	100	7.44	0.024 930
		Middle	5 220	13.43	100	7.44	0.024 307
		High	5 240	13.33	100	7.44	0.023 754
Non DFS 11n_HT40	ANT0	Low	5 190	7.50	100	4.71	0.003 309
		High	5 230	7.25	100	4.71	0.003 124
	ANT1	Low	5 190	8.15	100	4.13	0.003 363
		High	5 230	8.23	100	4.13	0.003 426
	ANT0+ANT1 (Calculated)	Low	5 190	10.85	100	7.44	0.013 419
		High	5 230	10.78	100	7.44	0.013 205

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm²

Formula

ANT0+ANT1 (Calculated)

Power : $10\log\{10^{(ANT0_Average\ Power/10)}+10^{(ANT1_Average\ Power/10)}\}$

Gain : $10\log\{10^{(ANT0_Antenna\ Gain/20)}+10^{(ANT1_Antenna\ gain/20)}\}^2/2$

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-. The highest MPE power density of 2.4 GHz band and 5 GHz band respectively

Band (MHz)	Operation Mode	Antenna	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
2 412 - 2 462	11n-HT20	ANT0+ANT1 (Calculated)	2 412	11.91	100	6.93	0.015 231
5 745 - 5 825	11n-HT20	ANT0+ANT1 (Calculated)	5 745	12.41	100	8.08	0.022 271
5 180 - 5 240	11n-HT20	ANT0+ANT1 (Calculated)	5 180	13.54	100	7.44	0.024 930
Combined							0.062 432

-Operation mode: Bluetooth

Band	Operation Mode	Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
2402 - 2480	Bluetooth BDR	Low	2 402	-6.92	31	4.40	0.000 035
		Middle	2 441	-6.73	31	4.40	0.000 036
		High	2 480	-8.16	31	4.40	0.000 026
	Bluetooth EDR	Low	2 402	-6.66	30	4.40	0.000 035
		Middle	2 441	-6.47	30	4.40	0.000 037
		High	2 480	-7.89	30	4.40	0.000 027
	Bluetooth LE GFSK	Low	2 402	-6.49	30	4.40	0.000 037
		Middle	2 442	-6.69	30	4.40	0.000 035
		High	2 480	-7.83	30	4.40	0.000 027

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm²

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-Operation mode: Bluetooth Low energy

Band	Operation Mode	Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)
2402 - 2480	Bluetooth Low Energy	Low	2 402	2.61	32	4.40	0.000 310
		Middle	2 442	2.49	32	4.40	0.000 301
		High	2 480	1.93	32	4.40	0.000 265

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm²

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