TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: TQ8-ADB12F1GG

Equipment Under Test	:	DISPLAY CAR SYSTEM
Model Name	:	ADB12F1GG
Variant Model Names	:	ADB10F1GP, ADB13F1GG, ADB14F1GG, ADB13F1MG, ADB10F1RP, ADB10F1GN, ADB10F1GL
Applicant	:	Hyundai Mobis Co., Ltd.
Manufacturer	:	Hyundai Mobis Co., Ltd.
Date of Receipt	:	2019.09.23
Date of Test(s)	:	2019.09.24 ~ 2019.11.06
Date of Issue	:	2019.12.03

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

Tested By: **Nancy Park** **Date:** **2019.12.03**

Technical Manager: **Jungmin Yang** **Date:** **2019.12.03**

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.

Telephone : +82 31 688 0901
FAX : +82 31 688 0921

1.2. Details of Applicant

Applicant : Hyundai Mobis Co., Ltd.
Address : 203, Teheran-ro, Gangnam-gu, Seoul, South Korea, 135-977
Contact Person : Choe, Seung-hoon
Phone No. : +82 31 260 0098

1.3. Details of Manufacturer

Company : Same as applicant
Address : Same as applicant

1.4. Description of EUT

Kind of Product	DISPLAY CAR SYSTEM
Model Name	ADB12F1GG
Variant Model Name	ADB10F1GP, ADB13F1GG, ADB14F1GG, ADB13F1MG, ADB10F1RP, ADB10F1GN, ADB10F1GL
Power Supply	DC 14.4 V
Frequency Range	2 402 ㎒ ~ 2 480 ㎒ (Bluetooth) 2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20) 5 180 ㎒ ~ 5 240 ㎒ (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 ㎒ ~ 5 230 ㎒ (Band 1: 11n_HT40, 11ac_VHT40) 5 210 ㎒ (Band 1: 11ac_VHT80) 5 260 ㎒ ~ 5 320 ㎒ (Band 2A: 11a/n_HT20, 11ac_VHT20) 5 270 ㎒ ~ 5 310 ㎒ (Band 2A: 11n_HT40, 11ac_VHT40) 5 290 ㎒ (Band 2A: 11ac_VHT80) 5 500 ㎒ ~ 5 720 ㎒ (Band 2C: 11a/n_HT20, 11ac_VHT20) 5 510 ㎒ ~ 5 710 ㎒ (Band 2C: 11n_HT40, 11ac_VHT40) 5 530 ㎒ ~ 5 690 ㎒ (Band 2C: 11ac_VHT80) 5 745 ㎒ ~ 5 825 ㎒ (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 ㎒ ~ 5 795 ㎒ (Band 3: 11n_HT40, 11ac_VHT40) 5 775 ㎒ (Band 3: 11ac_VHT80)
Modulation Technique	DSSS, OFDM, GFSK, π/4DQPSK, 8DPSK

Number of Channels	79 channels (Bluetooth) 11 channels (11b/g/n_HT20) 4 channels (Band 1: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 1: 11n_HT40, 11ac_VHT40) 1 channel (Band 1: 11ac_VHT80) 4 channels (Band 2A: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 2A: 11n_HT40, 11ac_VHT40) 1 channel (Band 2A: 11ac_VHT80) 9 channels (Band 2C: 11a/n_HT20, 11ac_VHT20) 4 channels (Band 2C: 11n_HT40, 11ac_VHT40) 2 channels (Band 2C: 11ac_VHT80) 5 channels (Band 3: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 3: 11n_HT40, 11ac_VHT40) 1 channel (Band 3: 11ac_VHT80)
Antenna Type	Pattern antenna
Antenna Gain	2 400 ㎒ ~ 2 483.5 ㎒: -0.18 ㏈i (Bluetooth) 2 400 ㎒ ~ 2 483.5 ㎒: -0.01 ㏈i (WLAN 2.4 G) 5 150 ㎒ ~ 5 250 ㎒: -0.61 ㏈i (WLAN 5G) 5 250 ㎒ ~ 5 350 ㎒: -0.18 ㏈i (WLAN 5G) 5 470 ㎒ ~ 5 725 ㎒: -0.77 ㏈i (WLAN 5G) 5 725 ㎒ ~ 5 850 ㎒: -0.18 ㏈i (WLAN 5G)

1.5. Information of Variant Models

Model	Model Name	USB	BT/WIFI	Broadcast Freq.	DAB	HD	Ecall	RDS	RBDS
Basic Model	ADB12F1GG	O	BT/WIFI	GEN					
Variant Models	ADB10F1GP	O	BT/WIFI	EUR					
	ADB13F1GG	O	BT	GEN				O	
	ADB14F1GG	O	BT/WIFI	GEN				O	
	ADB13F1MG	O	BT	GEN					O
	ADB10F1RP	O	BT/WIFI	EUR			O	O	
	ADB10F1GN	O	BT/WIFI	NA					
	ADB10F1GL	O	BT/WIFI	Columbia					

1.6. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501/RF-RTL014541	2019.11.22	Initial
1	F690501/RF-RTL014541-1	2019.12.03	Corrected the Power Density

2. RF Exposure Evaluation

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

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (㎒)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (㎽/㎠)	Average Time
(A) 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
300-1 500	-	-	f/300	6
1 500-100 000	-	-	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
300-1 500	-	-	f/1500	30
1 500-100 000	-	-	**1.0**	**30**

2.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

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

Pd the limit of MPE, 1 ㎽/㎠. 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.

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

Bluetooth

- Maximum tune up tolerance

Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 (㎽/㎠)	Limits (㎽/㎠)
2 402 ~ 2 480	4	-0.18	0.000 479	1

WLAN (2.4G)

- Maximum tune up tolerance

Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
2 412 ~ 2 462	12	-0.01	0.003 146	1

WLAN (5G)

- Maximum tune up tolerance

Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
5 180 ~ 5 240	10	-0.61	0.001 729	1
5 260 ~ 5 320	10	-0.18	0.001 909	1
5 500 ~ 5 720	10	-0.77	0.001 666	1
5 745 ~ 5 825	10	-0.18	0.001 909	1

Note;

- The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit of 1 ㎽/㎠.
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 ㎝ between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dBi and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

Simultaneous transmission of RF Exposure test exclusion for worst case configuration.

Bluetooth: the ratio is 0.000 479 / 1
WLAN: the ratio is 0.003 146 / 1

Confirm the sum result of individual MPEs ratio is ≤ 1.0;
Bluetooth + WLAN: (0.000 479 / 1) + (0.003 146 / 1)
= 0.003 625 ≤ 1.0

- End of the Test Report -