

TEST REPORT

of

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

FCC ID: TQ8-ADB20F6AN

Equipment Under Test : DISPLAY CAR SYSTEM
Model Name : ADB20F6AN
Variant Model Name : ADB11F6GU
Applicant : Hyundai Mobis Co., Ltd.
Manufacturer : Hyundai Mobis Co., Ltd.
Date of Receipt : 2019.07.31
Date of Test(s) : 2019.08.01 ~ 2019.08.21
Date of Issue : 2019.08.22

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

Tested By:




Nancy Park

Date:

2019.08.22

Technical
Manager:



Jungmin Yang

Date:

2019.08.22

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RTT5041-19(2019.04.24)(1)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mmx 297 mm)

INDEX

<u>Table of Contents</u>	Page
1. General Information -----	3
2. RF Exposure Evaluation -----	5

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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

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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	ADB20F6AN
Variant Model Name	ADB11F6GU
Power Supply	DC 14.4 V
Frequency Range	2 402 MHz ~ 2 480 MHz (Bluetooth) 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20) 5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40) 5 210 MHz (Band 1: 11ac_VHT80) 5 260 MHz ~ 5 320 MHz (Band 2A: 11a/n_HT20, 11ac_VHT20) 5 270 MHz ~ 5 310 MHz (Band 2A: 11n_HT40, 11ac_VHT40) 5 290 MHz (Band 2A: 11ac_VHT80) 5 500 MHz ~ 5 720 MHz (Band 2C: 11a/n_HT20, 11ac_VHT20) 5 510 MHz ~ 5 710 MHz (Band 2C: 11n_HT40, 11ac_VHT40) 5 530 MHz ~ 5 690 MHz (Band 2C: 11ac_VHT80) 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40) 5 775 MHz (Band 3: 11ac_VHT80)
Modulation Technique	DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 8DPSK

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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 MHz ~ 2 483.5 MHz: -0.18 dB i (Bluetooth) 2 400 MHz ~ 2 483.5 MHz: -0.01 dB i (WLAN 2.4 G) 5 150 MHz ~ 5 250 MHz: -0.61 dB i (WLAN 5G) 5 250 MHz ~ 5 350 MHz: -0.18 dB i (WLAN 5G) 5 470 MHz ~ 5 725 MHz: -0.77 dB i (WLAN 5G) 5 725 MHz ~ 5 850 MHz: -0.18 dB i (WLAN 5G)

1.5. Information of Variant Model

Model	Model Name	BT	WIFI	HD	RDS	GPS	AA/CP	Rear Camera	AMP
Basic Model	ADB20F6AN	O	O	O	X	O	O	O	Interior
Variant Model	ADB11F6GU	O	O	X	X	O	O	O	Interior

1.6. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501/RF-RTL014293	2019.08.22	Initial

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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

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/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: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

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

Bluetooth

- Maximum tune up tolerance

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

WLAN (2.4G)

- Maximum tune up tolerance

Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 412 ~ 2 462	10	-0.01	0.001 985	1

WLAN (5G)

- Maximum tune up tolerance

Frequency (MHz)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
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 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm².
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dB i and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

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

Bluetooth: the ratio is 0.000 479 / 1

WLAN: the ratio is 0.001 985 / 1

Confirm the sum result of individual MPEs ratio is ≤ 1.0 ;

Bluetooth + WLAN: $(0.000\ 479 / 1) + (0.001\ 985 / 1)$

$= 0.002\ 464 \leq 1.0$

- End of the Test Report -

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