SGS Korea Co., Ltd.
4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
Tel. +82 31 428 5700 / Fax. +82 31 427 2370
http://www.sgsgroup.kr

TEST REPORT

of

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

FCC ID: TQ8-ADC40J5AN

1. Equipment Under Test	:	DISPLAY CAR SYSTEM
2. Model Name	:	ADC40J5AN
3. Variant Model Name(s)	:	Refer to the page 4
4. Applicant	:	Hyundai Mobis Co., Ltd.
5. Manufacturer	:	Hyundai Mobis Co., Ltd.
6. Date of Receipt	:	2020.01.30
7. Date of Test(s)	:	2020.02.17 ~ 2020.03.06
8. Date of Issue	:	2020.03.27

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.

Tested by: **Jinhyoung Cho**

Technical Manager: **Jungmin Yang**

SGS Korea Co., Ltd. Gunpo Laboratory

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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	ADC40J5AN
Variant Model Names	ADC11J5GG, ADC10J5GN, ADC10J5GL, ADC10J5BB, ADC12J5GP, ADC12J5MG, ADC10J5EG, ADC10J5EP, ADC10J5GG, ADC11J5EP, ADC12J5EP, ADCC0J5EP, ADC10J5UX, ADC40J5KN, ADC10J5RP, ADC20J5FN, ADC12J5GG
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 2.4G) 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 Names			Description								
			AMP	USB	BT WIFI	HD	DAB	FM Frequency Range	FM Channel Space	AM Frequency Range	AM Channel Space
Basic Model	FCC	ADC40J5AN	Ex.	O	BT WIFI	O	X	87.5 ~ 107.9 ㎒	200 ㎑	530 ~ 1 710 ㎑	10 ㎑
Variant Models	FCC	ADC11J5GG	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	531 ~ 1 602 ㎑	9 ㎑
		ADC10J5GN	Ex.	O	BT WIFI	X	X	87.5 ~ 107.9 ㎒	200 ㎑	530 ~ 1 710 ㎑	10 ㎑
		ADC10J5GL	Ex.	O	BT WIFI	X	X	87.5 ~ 107.9 ㎒	100 ㎑	530 ~ 1 710 ㎑	10 ㎑
		ADC10J5BB	Ex.	O	BT WIFI	X	X	76.1 ~ 107.9 ㎒	100 ㎑	530 ~ 1 710 ㎑	10 ㎑
		ADC12J5GP	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	522 ~ 1 620 ㎑	9 ㎑
		ADC12J5MG	Ex.	O	BT	X	X	87.5 ~ 108.0 ㎒	100 ㎑	531 ~ 1 602 ㎑	9 ㎑
		ADC10J5EG	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	531 ~ 1 602 ㎑	9 ㎑
		ADC10J5EP	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	522 ~ 1 620 ㎑	9 ㎑
		ADC10J5GG	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	531 ~ 1 602 ㎑	9 ㎑
		ADC11J5EP	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	522 ~ 1 620 ㎑	9 ㎑
		ADC12J5EP	Ex.	O	BT	X	X	87.5 ~ 108.0 ㎒	100 ㎑	522 ~ 1 620 ㎑	9 ㎑
		ADCC0J5EP	Ex.	O	BT WIFI	X	O	87.5 ~ 108.0 ㎒	100 ㎑	522 ~ 1 620 ㎑	9 ㎑
		ADC10J5UX	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	531 ~ 1 701 ㎑	9 ㎑
		ADC40J5KN	Ex.	O	BT WIFI	O	X	87.5 ~ 107.9 ㎒	200 ㎑	530 ~ 1 710 ㎑	10 ㎑
		ADC10J5RP	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	522 ~ 1 620 ㎑	9 ㎑
		ADC20J5FN	Ex.	O	BT WIFI	O	X	87.5 ~ 107.9 ㎒	200 ㎑	530 ~ 1 710 ㎑	10 ㎑
		ADC12J5GG	Ex.	O	BT WIFI	X	X	87.5 ~ 108.0 ㎒	100 ㎑	531 ~ 1 602 ㎑	9 ㎑

1.6. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL000411	2020.03.18	Initial
1	F690501-RF-RTL000411-1	2020.03.27	Delete WWAN mode in simultaneous transmission calculation

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	10.5	-0.01	0.002 227	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	8.5	-0.77	0.001 180	1
5 745 ~ 5 825	8	-0.18	0.001 204	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.
- According to KDB 447498 D01 RF Exposure Guidance 4.1.d, Output Average Power to Antenna applied Maximum Tune up power considering tolerance.

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

Bluetooth: the ratio is 0.000 479 / 1
WLAN: the ratio is 0.002 227 / 1

Confirm the sum result of individual MPEs ratio is ≤ 1.0;
Bluetooth + WLAN: (0.000 479 / 1) + (0.002 227 / 1) = 0.002 706 ≤ 1.0

- End of the Test Report -