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TEST REPORT

of

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

FCC ID: TQ8-DA330GKAN

1. Equipment Under Test	:	DISPLAY CAR SYSTEM
2. Model Name	:	DA330GKAN
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	:	2020.04.02
7. Date of Test(s)	:	2020.04.03 ~ 2020.05.27
8. Date of Issue	:	2020.07.01

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: **Murphy Kim**

Technical Manager: **Inho Park**

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
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- Designation number: KR0150

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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	DIGITAL CAR SYSTEM
Model Name	DA330GKAN
Variant Model Names	DA331J9AN, DA330J9AN, DA330J9GG, DA331J9GG, DA332J9GG, DA333J9GG, DA330J9MG, DA330J9UA, DA330J9EG, DA330J9EP, DA335J9EP, DA331J9EP, DA332J9EP, DA333J9EP, DA334J9EP
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 5 G) 5 250 ㎒ ~ 5 350 ㎒: -0.18 ㏈i (WLAN 5 G) 5 470 ㎒ ~ 5 725 ㎒: -0.77 ㏈i (WLAN 5 G) 5 725 ㎒ ~ 5 850 ㎒: -0.18 ㏈i (WLAN 5 G)
H/W Version	1.0
S/W Version	1.0

1.5. Information of Variant Models

Model Names		Description						
		Local	Language	Frequency	RDS	BT/WIFI	HD	LTE
Basic Model	DA330GKAN	U.S.A	US	A2	X	O	O	O
Variant Models	DA331J9AN	U.S.A	US	A2	X	O	O	X
	DA330J9AN	U.S.A	US	A2	X	O	X	X
	DA330J9GG	General	US	A1	X	O	X	X
	DA331J9GG	General	US	A1	O	O	X	X
	DA332J9GG	General	US	A1	O	O	X	X
	DA333J9GG	South Africa	US	A1	O	O	X	X
	DA330J9MG	Middle East	Arabic	A1	X	BT only	X	X
	DA330J9UA	Australia	AU	A9	O	O	X	X
	DA330J9EG	Europe	UK	A1	X	O	X	X
	DA330J9EP	Europe	UK	A8	X	BT only	X	X
	DA335J9EP	Europe	UK	A8	O	O	X	X
	DA331J9EP	Europe	UK	A8	O	O	X	X
	DA332J9EP	Portugal	UK	A8	O	O	X	X
	DA333J9EP	Europe	UK	A8	O	O	X	X
	DA334J9EP	Portugal	UK	A8	O	O	X	X

BAND	CODE	FREQUENCY RANGE	STEP	LOCAL
FM	A1	87.5-108.0 ㎒	100 ㎑	DOM/GEN
AM		531-1 602 ㎑	9 ㎑	
FM	A2	87.5-107.9 ㎒	200 ㎑	NA/GEN
AM		530-1 710 ㎑	10 ㎑	
FM	A8	87.5-108.0 ㎒	100 ㎑	EU
AM		522-1 620 ㎑	9 ㎑	
FM	A9	87.5-108.0 ㎒	100 ㎑	AU
AM		522-1 701 ㎑	9 ㎑	

1.6. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL000867	2020.07.01	Initial

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. Test information of Cable Loss and Antenna Gain

Test Item	Frequency (㎒)	Cable Loss (㏈)	Antenna Gain (㏈i)	Final Antenna Gain (㏈i)
CDMA - BC0	824 ~ 849	-1.71	4.25	2.54
CDMA - BC1	1 850 ~ 1 910	-3.30	2.79	-0.51
LTE - Band 2	1 850 ~ 1 910	-3.30	2.79	-0.51
LTE - Band 4	1 710 ~ 1 755	-3.30	2.04	-1.26
LTE - Band 5	824 ~ 849	-1.71	4.25	2.54
LTE - Band 13	777 ~ 787	-1.71	3.61	1.90

Note;

- Final Antenna Gain (㏈i) = Cable Loss (㏈) + Antenna Gain (㏈i)

2.1.4. Output Power into Antenna & RF Exposure Evaluation Distance

Bluetooth

- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
2 400 ~ 2 483.5	3	-0.18	0.000 381	1

WLAN (2.4G)

- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
2 400 ~ 2 483.5	5	-0.01	0.000 628	1

WLAN (5G)

- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
5 150 ~ 5 250	9	-0.61	0.001 373	1
5 250 ~ 5 350	9	-0.18	0.001 516	1
5 470 ~ 5 725	7	-0.77	0.000 835	1
5 725 ~ 5 850	4	-0.18	0.000 479	1

CDMA - BC0

- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
824 ~ 849	25.7	2.54	0.132 657	0.55

CDMA - BC1

- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
1 850 ~ 1 910	25.7	-0.51	0.065 725	1

LTE - Band 2
- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
1 850 ~ 1 910	25.7	-0.51	0.065 725	1

LTE - Band 4
- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
1 710 ~ 1 755	25.7	-1.26	0.055 301	1

LTE - Band 5
- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
824 ~ 849	25.7	2.54	0.132 657	0.55

LTE - Band 13
- Maximum tune up tolerance

Frequency Range (㎒)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 ㎝ (㎽/㎠)	Limits (㎽/㎠)
777 ~ 787	25.7	1.90	0.114 480	0.52

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.

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

Bluetooth: the ratio is 0.000 381 / 1
WLAN: the ratio is 0.001 516 / 1
WWLAN: the radio is 0.132 657 / 0.55

Confirm the sum result of individual MPEs ratio is ≤ 1.0;
Bluetooth + WLAN + WWLAN: (0.000 381 / 1) + (0.001 516 / 1) + (0.132 657 / 0.55) = 0.243 092 ≤ 1.0

- End of the Test Report -