

Report Number: F690501/RF-RTL014428-2

TEST REPORT

of

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

FCC ID: TQ8-DA330G5AN

Equipment Under Test	:	DISPLAY CAR SYSTEM
Model Name	:	DA330G5AN
Variant Model Names	:	DA331G5AN, DA330G5EG, DA331G5EG, DA330G5EP, DA331G5EP, DA332G5EP, DT330G5AN, DA330G5GG, DA331G5GG, DA330G5GN, DA330G5GL, DA330G5MG, DA332G5EG, DA330G5FN
Applicant	:	Hyundai Mobis Co., Ltd.
Manufacturer	:	Hyundai Mobis Co., Ltd.
Date of Receipt	:	2019.08.31
Date of Test(s)	:	2019.09.02 ~ 2019.10.11
Date of Issue	:	2019.10.31

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

Tested By:	1	Date:	2019.10.31
	Murphy Kim		
Technical Manager:	han	Date:	2019.10.31
	Jungmin Yang		



Report Number: F690501/RF-RTL014428-2

INDEX

Table of Contents	Page
1. General Information	3
2. RF Exposure Evaluation	6



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	DA330G5AN				
Variant Model Names	DA331G5AN, DA330G5EG, DA331G5EG, DA330G5EP, DA331G5EP, DA332G5EP, DT330G5AN, DA330G5GG, DA331G5GG, DA330G5GN, DA330G5GL, DA330G5MG, DA332G5EG, DA330G5FN				
Power Supply	DC 14.4 V				
Frequency Range	2 402 Mb ~ 2 480 Mb (Bluetooth) 2 412 Mb ~ 2 462 Mb (11b/g/n_HT20) 5 180 Mb ~ 5 240 Mb (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 Mb ~ 5 230 Mb (Band 1: 11n_HT40, 11ac_VHT40) 5 210 Mb (Band 1: 11ac_VHT80) 5 260 Mb ~ 5 320 Mb (Band 2A: 11a/n_HT20, 11ac_VHT20) 5 270 Mb ~ 5 310 Mb (Band 2A: 11n_HT40, 11ac_VHT40) 5 290 Mb (Band 2A: 11ac_VHT80) 5 500 Mb ~ 5 720 Mb (Band 2C: 11a/n_HT20, 11ac_VHT20) 5 510 Mb ~ 5 710 Mb (Band 2C: 11a/n_HT40, 11ac_VHT40) 5 530 Mb ~ 5 690 Mb (Band 2C: 11ac_VHT80) 5 745 Mb ~ 5 825 Mb (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 Mb ~ 5 795 Mb (Band 3: 11a/n_HT40, 11ac_VHT40) 5 775 Mb (Band 3: 11ac_VHT80)				
Modulation Technique	DSSS, OFDM, GFSK, π/4DQPSK, 8DPSK				

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <u>http://www.sgsgroup.kr</u>

RTT5041-19(2019.04.24)(1)

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



Report Number: F690501/RF-RTL014428-2

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: 11n_HT40, 11ac_VHT40) 3 channels (Band 2C: 11a/n_HT20, 11ac_VHT40) 2 channels (Band 3: 11a/n_HT20, 11ac_VHT40) 1 channel (Band 3: 11a/n_HT40, 11ac_VHT40) 1 channel (Band 3: 11ac_VHT80)
Antenna Type	Pattern antenna
Antenna Gain	2 400 Mb ~ 2 483.5 Mb: -0.18 dB i (Bluetooth) 2 400 Mb ~ 2 483.5 Mb: -0.01 dB i (WLAN 2.4 G) 5 150 Mb ~ 5 250 Mb: -0.61 dB i (WLAN 5G) 5 250 Mb ~ 5 350 Mb: -0.18 dB i (WLAN 5G) 5 470 Mb ~ 5 725 Mb: -0.77 dB i (WLAN 5G) 5 725 Mb ~ 5 850 Mb: -0.18 dB i (WLAN 5G)



1.5. Information of Variant Models

		Description									
Model Names			Frequency	RDS	BT, Wi-Fi	HD	DAB	AA/CP	SXM/LTE	Rear Camera	AMP
Basic	FCC	DA330G5AN	A2	Х	0	0	Х	0	Х	0	Internal
Models	IC	DA330G5KN	A2	Х	0	0	Х	0	Х	0	Internal
		DA331G5AN	A2	Х	0	0	Х	0	Х	0	Internal
		DA330G5EG	A1	Х	0	Х	Х	0	Х	0	Internal
		DA331G5EG	A1	0	0	Х	0	0	Х	0	Internal
		DA330G5EP	A8	Х	0	Х	Х	0	Х	0	Internal
		DA331G5EP	A8	0	0	Х	Х	0	Х	0	Internal
		DA332G5EP	A8	0	0	Х	0	0	Х	0	Internal
	FCC	DT330G5AN	A2	Х	0	0	Х	0	0	0	Internal
Variant Models		DA330G5GG	A1	Х	0	Х	Х	0	Х	0	Internal
		DA331G5GG	A1	0	0	Х	Х	0	Х	0	Internal
		DA330G5GN	A2	Х	0	Х	Х	0	Х	0	Internal
		DA330G5GL	A5	Х	0	Х	Х	0	Х	0	Internal
		DA330G5MG	A1	Х	0	Х	Х	0	Х	0	Internal
		DA332G5EG	A1	0	0	Х	Х	0	Х	0	Internal
		DA330G5FN	A2	Х	0	Х	Х	0	Х	0	Internal
	IC	DT330G5KN	A2	Х	0	0	Х	0	0	0	Internal

1.6. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501/RF-RTL014428	2019.10.11	Initial
1	F690501/RF-RTL014428-1	2019.10.16	Revised the Information of variant Models
2	F690501/RF-RTL014428-2	2019.10.31	Added WWAN MPE result



2. RF Exposure Evaluation

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

Frequency Range (Mb)	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				
<u>300-1 500</u>	-	-	<u>f/1500</u>	<u>30</u>				
<u>1 500-100 000</u>	-	-	<u>1.0</u>	<u>30</u>				

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R²)

Where Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in \mbox{cm}

Pd 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.

 SGS Korea Co., Ltd. (Gunpo Laboratory)
 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
 http://www.sgsgroup.kr

 RTT5041-19(2019.04.24)(1)
 Tel. +82 31 428 5700 / Fax. +82 31 427 2370
 A4(210 mm × 297 mm)

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.



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 (Mtz)	Cable Loss (dB)	Antenna Gain (dB i)	Final Antenna Gain (dB i)
CDMA - BC0	824 ~ 849	-1.79	3.39	1.60
CDMA - BC1	1 850 ~ 1 910	-2.62	2.90	0.28
LTE - Band 2	1 850 ~ 1 910	-2.62	2.90	0.28
LTE - Band 4	1 710 ~ 1 755	-2.62	1.45	-1.17
LTE - Band 5	824 ~ 849	-1.79	3.39	1.60
LTE - Band 13	777 ~ 787	-1.79	1.99	0.20

Note;

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



2.1.4. Output Power into Antenna & RF Exposure Evaluation Distance

Bluetooth

- Maximum tune up tolerance

Frequency (雁)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (n₩/crr/)	Limits (nW/cn²)
2 402 ~ 2 480	4	-0.18	0.000 479	1

WLAN (2.4G)

- Maximum tune up tolerance

Frequency (₩₂)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (n₩/cm²)	Limits (nW/cn²)
2 412 ~ 2 462	12	-0.01	0.003 146	1

WLAN (5G)

- Maximum tune up tolerance

Frequency (脞)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Power Density at 20 cm (n\/cm)	Limits (nW/cn²)
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

CDMA - BC0

- Maximum Tune Up Tolerance

Frequency Range (雁)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm/)	Limits (n₩/cn²)
824 ~ 849	25.7	1.60	0.106 839	0.55

CDMA - BC1

- Maximum Tune Up Tolerance

Frequency Range (雁)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm/)	Limits (nW/cn²)
1 850 ~ 1 910	25.7	0.28	0.078 837	1

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <u>http://www.sgsgroup.kr</u>



A4(210 mm × 297 mm)

LTE - Band 2

- Maximum Tune Up Tolerance

Frequency Range (脸)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm/)	Limits (mW/cm²)
1 850 ~ 1 910	25.7	0.28	0.078 837	1

LTE - Band 4

- Maximum Tune Up Tolerance

Frequency Range (脞)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm/)	Limits (n₩/cn²)
1 710 ~ 1 755	25.7	-1.17	0.056 459	1

LTE - Band 5

- Maximum Tune Up Tolerance

Frequency Range (ᡅ)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (ɪʷ/cɪ/)	Limits (n₩/cn²)
824 ~ 849	25.7	1.60	0.106 839	0.55

LTE - Band 13

- Maximum Tune Up Tolerance

Frequency Range (雁)	Output Average Power to Antenna (dB m)	Final Antenna Gain (dB i)	Power Density at 20 cm (mW/cm/)	Limits (n₩/cn²)
777 ~ 787	25.7	0.20	0.077 398	0.52

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 $\,{\rm cm}\,$ 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.

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.



Simultaneous transmission of MPE test exclusion for worst case configuration.

Bluetooth: the ratio is 0.000 479 / 1 WLAN: the ratio is 0.003 146 / 1 WWAN: the ratio is 0.106 839 / 0.55

Confirm the sum result of individual MPEs ratio is \leq 1.0; Bluetooth + WLAN + WWAN: (0.000 479 / 1) + (0.003 146 / 1) + (0.106 839 / 0.55) = 0.660 464 \leq 1.0

So this device meets the KDB447498 D01 v06 section 7.2 requirement of "Simultaneous transmission MPE test exclusion"

- End of the Test Report -

The results of this test report are effective only to the items tested. The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received. This test report cannot be reproduced, except in full, without prior written permission of the Company. This test report does not assure KOLAS accreditation.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <u>http://www.sgsgroup.kr</u>

RTT5041-19(2019.04.24)(1)

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