TEST REPORT

of

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

FCC ID: TQ8-AVC42G5AN

Equipment Under Test	:	DIGITAL CAR AVN SYSTEM
Model Name	:	AVC42G5AN
Variant Model Name		AVC43G5AN
Applicant	:	Hyundai Mobis Co., Ltd.
Manufacturer	:	Hyundai Mobis Co., Ltd.
Date of Receipt	:	2018.11.19
Date of Test(s)	:	2018.12.06 ~ 2019.01.15
Date of Issue	:	2019.01.15

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

Tested By: **Jinhyoung Cho** **Date:** **2019.01.15**

Technical Manager: **Harim Lee** **Date:** **2019.01.15**

INDEX

Table of Contents Page

1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- Wireless Div. 2FL, 10-2, 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.

Phone No. : +82 31 688 0901
Fax No. : +82 31 688 0921

1.2. Details of Applicant

Applicant : Hyundai Mobis Co., Ltd.
Address : 203, Teheran-ro, Gangnam-gu, Seoul, South Korea, 06141
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 AVN SYSTEM
Model Name		AVC42G5AN
Variant Model Name		AVC43G5AN
Power Supply		DC 14.4 V
Frequency Range		2 402 ㎒ ~ 2 480 ㎒ (Bluetooth), 2 412 ㎒ ~ 2 462 ㎒ (11b/g/n_HT20), 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), 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)
Modulation Technique		DSSS, OFDM, GFSK, π/4DQPSK, 8DPSK
Number of Channels		79 channel (Bluetooth), 11 channel (11b/g/n_HT20), 5 channel (Band 3: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 3: 11n_HT40, 11ac_VHT40), 1 channel (Band 3: 11ac_VHT80), 4 channel (Band 1: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 1: 11n_HT40, 11ac_VHT40), 1 channel (Band 1: 11ac_VHT80), 4 channel (Band 2A: 11a/n_HT20, 11ac_VHT20), 2 channel (Band 2A: 11n_HT40, 11ac_VHT40), 1 channel (Band 2A: 11ac_VHT80), 9 channel (Band 2C: 11a/n_HT20, 11ac_VHT20), 4 channel (Band 2C: 11n_HT40, 11ac_VHT40), 2 channel (Band 2C: 11ac_VHT80)
Antenna Type		PCB pattern antenna
Antenna Gain	**Bluetooth**	2 400 ㎒ ~ 2 4835 ㎒: -0.59 ㏈i
	WLAN	2 400 ㎒ ~ 2 4835 ㎒: -0.70 ㏈i, 5 150 ㎒ ~ 5 250 ㎒: 1.93 ㏈i, 5 250 ㎒ ~ 5 350 ㎒: 1.92 ㏈i, 5 470 ㎒ ~ 5 725 ㎒: 2.28 ㏈i, 5 725 ㎒ ~ 5 850 ㎒: -0.84 ㏈i

1.5. Information of Variant Models

Model Name		Description
Basic model	AVC42G5AN	- Basic Model
Variant model	AVC43G5AN	- Same to basic model, It's different only software.

1.6. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL013419	2019.01.15	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	2.80	1.09
CDMA - BC1	1 850 ~ 1 910	-3.30	5.23	1.93
LTE - Band 2	1 850 ~ 1 910	-3.30	5.23	1.93
LTE - Band 4	1 710 ~ 1 755	-3.30	3.96	0.66
LTE - Band 5	824 ~ 849	-1.71	2.80	1.09
LTE - Band 13	777 ~ 787	-1.71	1.38	-0.33

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 (㎽/㎠)
2 402 ~ 2 480	4	-0.59	0.000 436	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	-0.70	0.001 693	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	9	1.93	0.002 465	1
5 260 ~ 5 320	9	1.92	0.002 459	1
5 500 ~ 5 720	9	2.28	0.002 671	1
5 745 ~ 5 825	9	-0.84	0.001 302	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	1.09	0.080 859	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	1.93	0.098 114	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	24	1.93	0.077 935	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	24	0.66	0.058 174	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	24	1.09	0.064 229	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	24	-0.33	0.046 316	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.

Simultaneous transmission of MPE test exclusion for worst case configuration.

Bluetooth: the ratio is 0.000 436 / 1
WLAN: the ratio is 0.002 671 / 1
CDMA: the ratio is 0.080 859 / 0.55
LTE: the ratio is 0.064 229 / 0.55

Confirm the sum result of individual MPEs ratio is ≤ 1.0;
Bluetooth + WLAN + CDMA + LTE: (0.000 436 / 1) + (0.002 671 / 1) + (0.080 859 / 0.55) + (0.064 229 / 0.55) = 0.266 903 ≤ 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 -